AEi Systems

Power IC Model Library™

for PSpice®

Model Documentation

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Trademarks

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Chapter 1 - Overview

Welcome

Thank you for purchasing the AEi Systems Power IC Model Library for PSpice.

SMPS applications today are much more demanding than ever. Today's designs require increases in switching frequency, higher efficiency and lower standby current. State space based models simply do not reveal many important nonlinear factors that influence these performance characteristics. To address the needs of today's power supply designer, AEi Systems introduced the Power IC Model Library for PSpice. This library represents a major breakthrough for SMPS designers who use PSpice.

AEi Systems has spent years developing accurate and robust models for the components that are used in power designs. We test our models thoroughly so you can have confidence in the model's operation and results. Useful examples are also provided for most of the models.

The library incorporates a comprehensive set of large signal hyper-accurate cycle-by-cycle simulation models for Pulse Width Modulation (PWM), Switching Regulators, Phase Shift Controllers and other Power ICs. You can perform high-speed, cycle-by-cycle simulation to show true large-signal performance, simulate current-mode control using the latest accurate modeling techniques, run CCM and DCM converter simulations, analyze control systems including loop gain, input filter design and analysis, and measure power stage loss and stress analysis for all major components. In summary, you can simulate your entire power system.

Nonlinear characteristics such as propagation delay, switching speed, drive capability and maximum duty cycle/current limits, startup phenomena are all accurately modeled. You can directly compare the performance of components from different vendors and analyze the effects of different implementations such as peak current mode control, hysteric current control, low voltage, and low operating current, to name just a few.

Summary of Benefits:

- Analyze large signal effects like start-up transients, power stage semiconductor stress, and step-load response
- Explore different approaches to transformer, converter, filter, and control structures
- Compute component stresses and test for excessive power dissipation
- Compare circuit characteristics with linear and nonlinear magnetics
- Analyze in both time and frequency domains
- Simulate and analyze your entire power supply without ANY limitations.

The models utilize analog behavioral elements, special Boolean logic elements and other specially designed function blocks. Together they greatly reduce the model’s simulation runtime, while maintaining “better than data sheet max/min” accuracy, an important factor in SMPS analysis.

Components are normally modeled to match “Typical” part performance at room temperature. Some temperature performance variations are also taken into account.

What's Included – Getting Started

The Power IC Model Library includes over 550 PSpice syntax compatible models in multiple model library files (See Chapter 4, Library Listings). Example schematics in native format and symbols for both OrCAD Capture and MicroSim Schematics are included.

Files included and their location after installation:

PSpice Power Library Folder

- License files and documentation

PowerLib Folder

Library Folder - Models and Symbols

- PSpice Model Libraries Files for both Capture and Schematics (.LIB)
- Symbol Files for both Capture and Schematics (.OLB, .OLJ, .SLB)

Examples Folder – OrCAD Capture Schematics

Various Folders (by manufacturer)

- Capture schematic files (.OPJ, .DSN, .SCH)

MicroSim Folder - MicroSim Schematics Files

Various Folders (by manufacturer)

- Schematics Files (.SCH, .NET, .ALS, etc.)

Documentation Folder - Manual and Model Reference Documentation

Installing the Power IC Model Library

The Power IC Model Library installation utility will install the library and other files onto your computer regardless of the version of PSpice you are using.

For PSpice versions 10.0 or higher the utility will also automatically configure OrCAD to use the libraries. For older versions of PSpice please follow the instructions provided in the next section.

Please see the relevant portions of your OrCAD or MicroSim User's Guide for details on how to incorporate new models and/or symbols into the design environment.

Symbol and model libraries generally use the name of the IC manufacturer whose parts are modeled in the library. The models in a .LIB file have corresponding symbols in the same named symbol file. Please see Chapter 4, Library Listings, for information on where specific models and symbols are located.

Master Library File

The **Power_EMA_AEI.LIB** file contains a list of all of the library files and may be used to include all of the models in the Power IC Model Libraries in a manner similar to the NOM.LIB file (Nom.Lib is distributed with PSpice).

In some cases, common sub-blocks called by a subcircuit in one library might be located in another library. That's why it is best to use the Power_EMA_AEI.LIB master library file to incorporate models into your simulations and schematic environment.

Important Note: It is recommended that Power IC Model Library files and symbols NOT be placed in the same directory as the OrCAD delivered files in order to avoid any naming conflicts that may arise in the future.

MicroSim Schematics

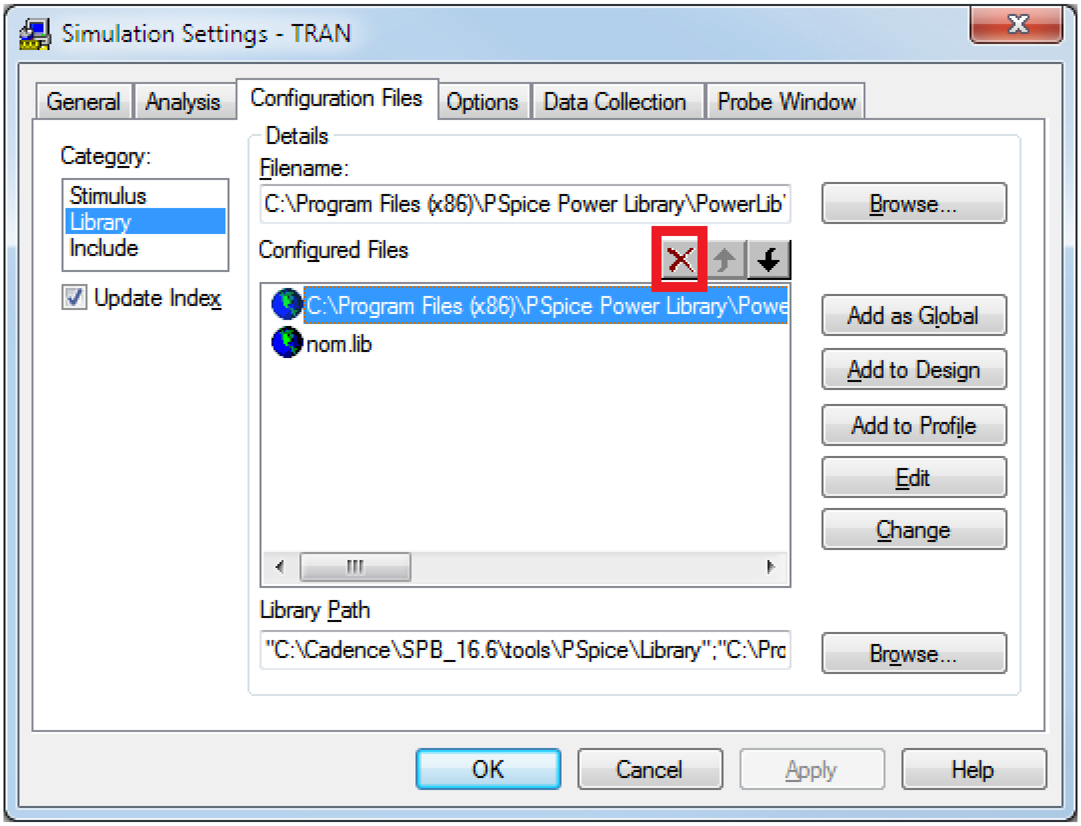
While the MicroSim Schematics files are included in the relevant OrCAD schematics folders a separate folder set is included for MicroSim Schematics users that only includes the relevant *.SCH file, without any OrCAD Capture related files.

You may have to edit the Library Settings using the Editor Configuration function in the Options menu in order to get MicroSim Schematics to recognize the .SLB symbol files.

Uninstalling the Power Library Files

1. Use the Add/Remove Program feature in the Window Control Panel to uninstall the Power IC Model Library.
2. After the uninstalling is complete, go to the Simulation Settings window and select the Power IC Model Libraries from the list in the Configured Files section.

3. Delete the Power_EMA_AEI.lib item from this list, by clicking on the "X" symbol button just above the list.



Category: Stimulus, Library, Include

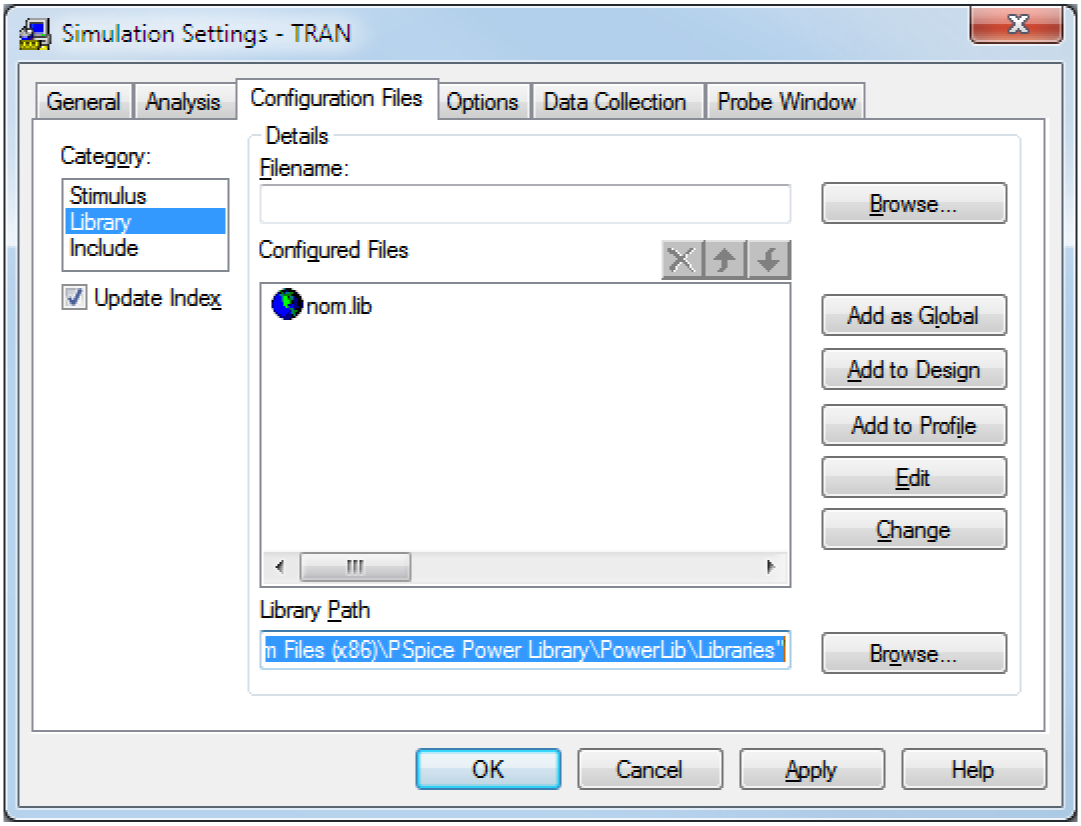
☑ Update Index

Filename: C:\Program Files (x86)\PSpice Power Library\PowerLib'

Configured Files:
C:\Program Files (x86)\PSpice Power Library\Powe
nom.lib

Library Path: "C:\Cadence\SPB_16.6\tools\PSpice\Library";"C:\Prc

4. Delete the portion of the Library Path where the Power IC Model Libraries was installed. By default this is ;"C:\Program Files (x86)\PSpice Power Library\PowerLib\Libraries"



Category: Library

☑ Update Index

Configured Files: nom.lib

Library Path: n Files (x86)\PSpice Power Library\PowerLib\Libraries"

5. This will ensure that Power IC Model Library and its components are completely removed from all your future PSpice projects.

Configuring the Power Library

1. Open a new or an existing PSpice project.

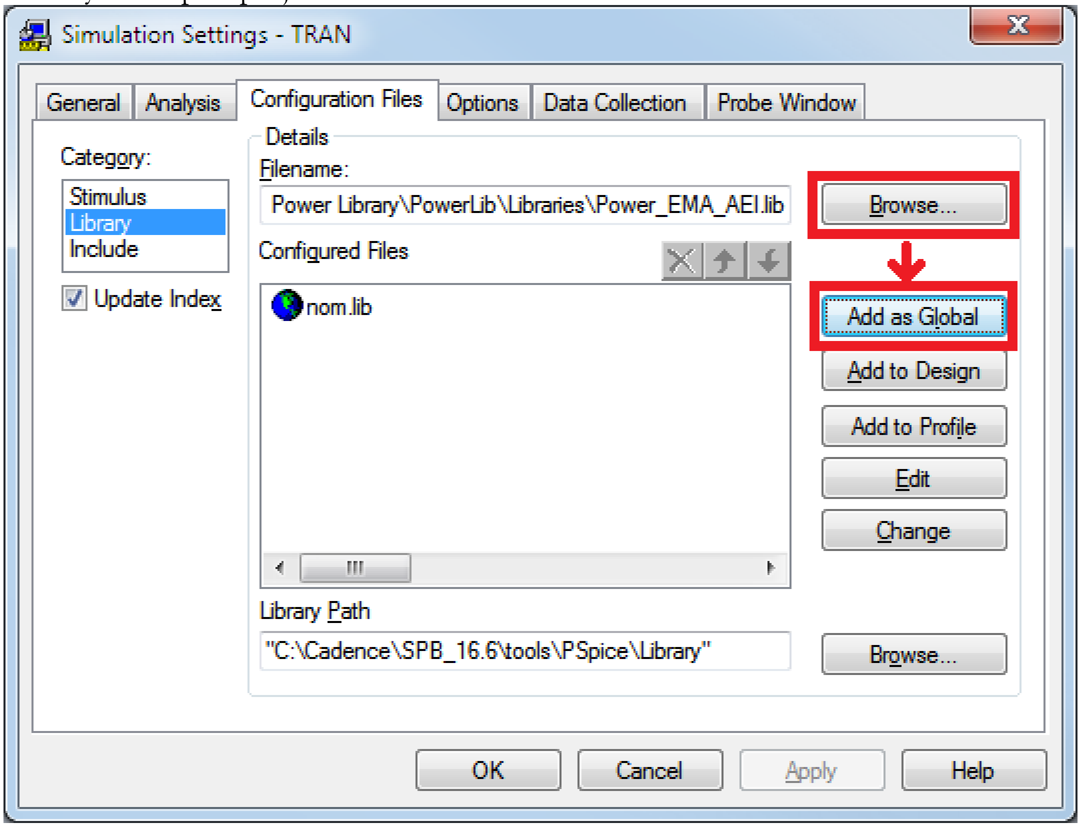
2. From the PSpice Menu, choose New Simulation Profile (provide a new name for the profile) or Edit Simulation Profile.

3. In the Simulation Settings window, chose the Configuration Files tab.
4. Choose Library from the Category list, seen on the left hand side.

5. Click on the Browse button in the Details section to the right of the Filename box and browse to the location in your machine where the Power IC Model Library was installed during the installation process. By default the library and its components are saved within
C:\Program Files (x86)\PSpice Power Library

6. Locate “Power_EMA_AEI.lib” which is located in C:\Program Files (x86)\PSpice Power Library\PowerLib\Libraries and click Open.

7. Click on Add as Global and the models in the Power IC Model Libraries (which now will appear on the top of the list under Configured Files section) are now ready to use in your PSpice projects.



Simulation Settings - TRAN

Category: Library

☑ Update Index

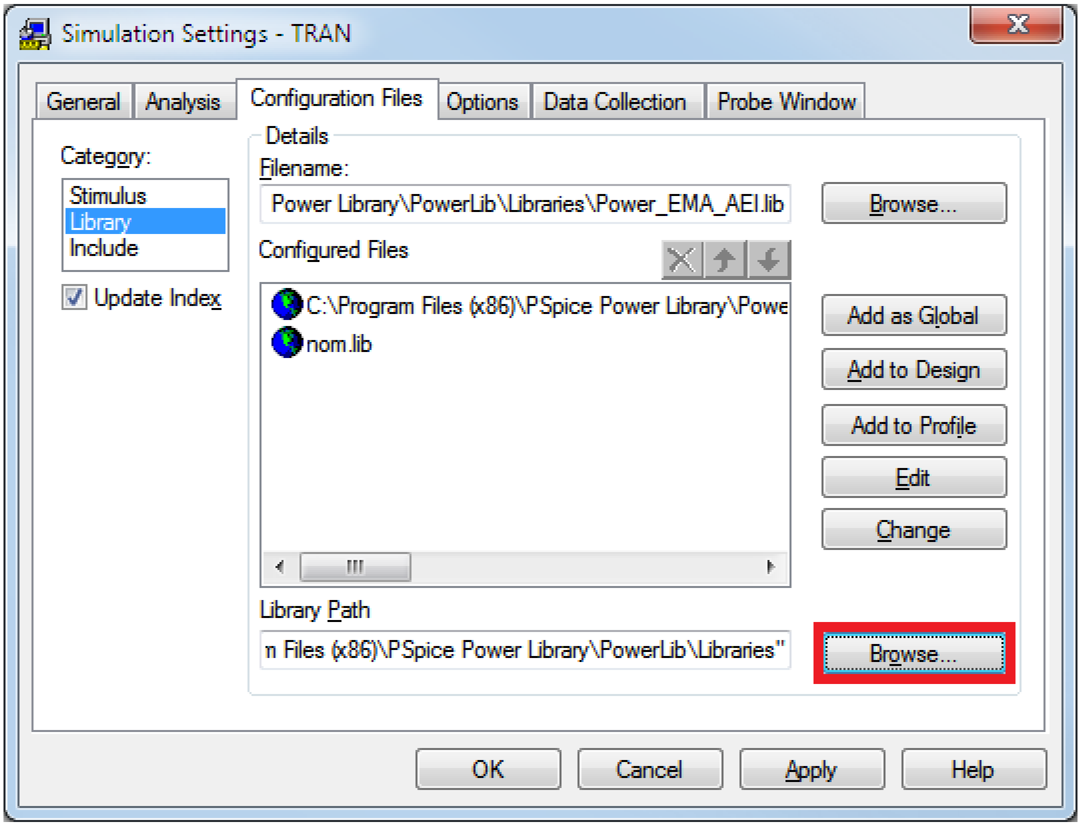
Filename: Power Library\PowerLib\Libraries\Power_EMA_AEI.lib

Configured Files: nom.lib

Library Path: "C:\Cadence\SPB_16.6\tools\PSpice\Library"

Optional: In order to be able to right click on a symbol of a model from the Power IC Model Library and select Edit PSpice Model, you need to perform this step.

8. Click on the Browse button in the Details section to the right of the Library Path box and browse to the library path of where the Power IC Model Library was installed during the installation process and click on the OK button. The file path will be appended onto the Library Path string by a semicolon (;). By default, the library files are saved within C:\Program Files (x86)\PSpice Power Library\PowerLib\Libraries



Category:
Stimulus
Library
Include

☑ Update Index

Filename: Power Library\PowerLib\Libraries\Power_EMA_AEI.lib

Configured Files
C:\Program Files (x86)\PSpice Power Library\Powe
nom.lib

Library Path: n Files (x86)\PSpice Power Library\PowerLib\Libraries"

9. Click OK to exit the Simulation Settings window.

Model Documentation and Support

Each model in the AEi Systems Power IC library is tested under various conditions using multiple test circuits for specific functions and then again in one or more full application test circuits. The results are compared to data sheet performance and in most cases actual bench measurements.

AEi Systems strives to produce models that meet all key performance metrics and exhibit "typical" performance as specified in the data sheet or performance that is within given Max-Min specifications.

Adobe Acrobat .PDF files containing documentation for various models in the library are included in the Documentation folder on the distribution CD.

The documentation discusses the model development and architecture and contains the results of the testing and verification process.

The support section of AEi System's web site, http://www.aeng.com/support.asp, contains additional model documentation and various white papers on simulation and modeling.

Documentation for other models that are not on the distribution CD may or may not be available. Please inquire with AEi Systems directly at info@aeng.com.

If you purchased this library from EMA Design Automation, you may get support in any of the following ways:

EMA Resource Center	http://support.ema-eda.com
e-mail	techsupport@ema-eda.com
Telephone	585-334-6001 option 5

Chapter 2 - Model Discussions

Model Usage

The majority of the models in the Power IC Model Libraries are transient time-domain models. That includes the FET Drivers and majority of the controller models (parts without an "s" extension in the model name).

The controller models are normally pin-for-pin compatible with the actual physical part. All key functions of the actual chip are modeled with the exception of variations with temperature. This includes startup nonlinearities and other transient phenomenon. Smoke alarm parameters are not currently implemented. While over-current and other protection functions are modeled, stimulus or supply voltages that exceed the data sheet minimums or maximums may produce unreliable results.

The models are characterized for typical operation at room temperature.

The transient models can be used in all types of simulations including startup, line transient, load transient, and steady state, provided that the external circuit and stimulus are properly adjusted.

The transformer and semiconductor models can be used in either transient or frequency domain simulations.

For switching circuit simulations linearized models are required in order to perform frequency domain simulations. The switching based transient controller models can not be used in frequency domain simulations. Models that are linearized fall into the classification of "state space" models. While a variety of state space models are available on the Internet, the Power IC Model Library includes Boost, Buck, Forward, and Flyback "PWM" blocks. See references 1 and 2 for more information on these blocks.

Frequency domain versions of various PWM controllers are included in the Power IC Model Library. Many will have an "s" appended to their model name as in the LT1242s and UC1845As. Several example .AC simulations are included (UC1842STATESPACE.DSN, UC1843ASTEST.DSN, NCP1000AVGTEST.DSN, etc.). Please see the list of models, "Power_Library_List_4.2.pdf" for specific model names and functionality.

Using the Models with Other Simulators

In order to produce models that are accurate but run in a reasonable time frame, AEi Systems uses a combination of actual semiconductors and behavioral modeling constructs to model power ICs. Two constructs are utilized frequently; the switch with hysteresis and If-Then-Else expressions.

Not all versions of PSpice support a switch with hysteresis. While the S_ST Short-Transition switch model, which emulates the Berkeley SPICE 3 S element, is now available, older versions of PSpice (prior to v9.2.3) did not support the hysteresis effect. A subcircuit, shown below, is utilized in order to provide compatibility with all versions of PSpice without compromising performance.

```
.subckt SWhyste NodeMinus NodePlus Plus Minus PARAMS: RON=1 ROFF=100MEG
VT=1.5 VH=.5
S5 NodePlus NodeMinus 8 0 smoothSW
EBcrtl 8 0 Value = { IF ( V(plus)-V(minus) > V(ref), 1, 0 ) }
EBref ref1 0 Value = { IF ( V(8) > 0.5, {VT-VH}, {VT+VH} ) }
Rdel ref1 ref 70
Cdel ref 0 100p  IC={VT+VH}
Rconv1 8 0 10Meg
Rconv2 plus 0 10Meg
Rconv3 minus 0 10Meg
.model smoothSW VSWITCH (RON={RON} ROFF={ROFF} VON=1 VOFF=0)
.ends SWhyste
```

If-Then-Else expressions in the E and G elements are also used for various logic and controlling functions. In them, mathematical equations using Boolean combinations of node voltages and branch currents are utilized.

For example,

```
GB1 33 2 Value= { IF ( V(5) > 2.5 & V(11) > 4.3 , -.014 , 0 ) }
EB19 44 0 Value= { IF ( V(22)<1 , 2 , IF ( V(30)<1 & V(42)<1 , 2 , V(30) ) ) }
```

If you are trying to use the models with other SPICE based simulators you will have to make sure that the simulator supports these extensions to the basic SPICE primitive set.

If you need one or more of the models translated to another SPICE syntax please contact AEi Systems directly.

Chapter 3 - Using the Power IC Model Schematic Examples

Schematic Examples

The Power IC Model Library for PSpice includes a number of application test circuit examples. Some are simple; others are fairly complicated and mimic the actual applications circuit found in the data sheet. All should run in a few minutes or less on most computers.

The example schematic designs can be found in two folders on the distribution CD. Under the PowerLib folder is an Examples folder. That contains the schematics for the OrCAD Capture system. The MicroSim folder contains approximately the same set of examples for the MicroSim Schematics environment.

A master library file has been created called Power_EMA_AEI.lib. It is in the Libraries folder along with the rest of the model libraries. You can refer to this file in order to include all of the models in the parts database for either OrCAD Capture Library Configuration or the MicroSim Schematics Library and Include Files… function (Analysis menu)

The MicroSim Schematics editor may not be able to find the symbol library files depending on where you choose to install them. You can correct this problem by pointing to the symbol library file on your hard disk using the Editor Configuration… function in the Options menu.

Most parts have an equivalent test circuit matched to their name. In some cases, where there is a family of parts there may be fewer test circuits than parts, but the parts are normally interchangeable, in so far as the test circuit is concerned, allowing the same test circuit to serve the part family.

The test circuits will allow you to explore the basic functionality of the model, if not its entire range of features.

Types of Simulations

Simulation Run Times

The time it takes to run a switch mode power supply simulation is directly related to a number of factors:

- Your computer's performance
- Complexity of the model and external circuitry
- Length of the simulation
- Time step of the simulator

The last item is driven by a number of factors including the stimulus and loading, soft-start and compensation components, the simulator .OPTION tolerances, the TMAX timestep setting, and the overall frequency content of the circuit (edge speeds).

It is not uncommon for SMPS simulations to take 15-60 minutes each. However, most of the example simulations run in just a few minutes.

Startup Simulations

Startup simulations can take a long time to run depending on the conditions and compensation settings. You can recognize these simulations in the examples because they normally don't use the UIC (use initial conditions) transient directive and use VCC/stimulus settings that start at zero and are pulsed on to their terminal voltage. In addition, initial conditions on input, output or compensation capacitors are not utilized.

Steady State, Line, Load Transient Simulations

In order to speed up the simulation of these types of analyses it is best to try to set initial conditions on key storage elements. This helps to get the circuit running at or near steady state almost immediately. This is as opposed to running a startup type simulation and delaying the data taking interval until steady is achieved. To do this, the UIC option is used and IC= directives are inserted, especially on input output, and compensation capacitors.

Correct initial conditions can allow a circuit that would normally take several milliseconds of time to start to get to steady state in a few hundred microseconds.

Incorrect initial conditions, whether they are set by the .NODESET, .IC, or IC= directives can cause the PSpice simulation to take much longer than if it were started from a zero voltage state due to transient residues or can cause convergence problems. In some circuits the initial conditions on compensation components can be very sensitive with respect to simulation settling time, with a few tenths of a volt making a huge difference in settling/runtime.

Except in cases where the compensation is internal, the models in the Power IC Model Library are setup to allow you to achieve steady state by setting initial conditions on elements external to the part.

Simulation Convergence – Quick Fix

If you encounter a convergence problem change the .OPTIONS settings you are using to the following:

- **Abstol = 0.01u (Default=1p)**
- **Vntol = 10u (Default=1u)**
- **Gmin=0.1n (Default=1p)**
- **Reltol = 0.01 (Default=0.001)**
- **ITL4 = 500 (Default=10)**

This should cure most simulation convergence problems unless there is an error in your circuit description.

Switching simulations refer to simulations which have a significant number of repetitive cycles, such as those found in SMPS simulations. Most of the simulation you perform with the Power IC Models will be of this type.

SMPS simulations can experience a large number of rejected time points. Rejected time points are due to the fact that PSpice has a dynamically varying time step which is controlled by constant tolerance values (Reltol, Abstol, Vntol). An event that occurs during each cycle, such as the switching of a power semiconductor, can trigger a reduction in the time step value. This is caused by the fact that PSpice attempts to maintain a specific accuracy, and adjusts the time step in order to accomplish this task. The time step is increased after the event, until the next cycle, when it is again reduced. This time step hysteresis can cause an excessive number of unnecessary calculations. To correct this problem, we can regress to a SPICE 2 methodology and force the simulator to have a fixed time step value.

To force the time step to be a fixed value, set the Trtol value to 25, i.e. .OPTIONS TRTOL=25. The default value is 7. The Trtol parameter controls how far ahead in time SPICE tries to jump. The value of 25 causes PSpice to try to jump far ahead. Then set the

Tmax value (maximum allowed time step) in the .TRAN statement to a value which is between 1/10 and 1/100 of the switching cycle period. This has the opposite effect; it forces the time step to be limited. Together, they effectively lock the simulator time step to a value which is between 1/10 and 1/100 of the switching cycle period, and eliminate virtually all of the rejected time points. These settings can result in over a 100% increase in speed!

Note: In order to verify the number of accepted and rejected time points, you may issue the .OPTIONS ACCT parameter and view the data at the end of the output file.

If this does not help the simulation converge proceed to the next section which has more details.

Simulation Convergence

The answer to a nonlinear problem, such as those in the SPICE DC and Transient analyses, is found via an iterative solution. For example, PSpice makes an initial guess at the circuit's node voltages and then, using the circuit conductances, calculates the mesh currents. The currents are then used to recalculate the node voltages, and the cycle begins again. This continues until all of the node voltages settle to values which are within specific tolerance limits. These limits can be altered using various .Options parameters such as Reltol, Vntol, and Abstol.

If the node voltages do not settle down within a certain number of iterations, the DC analysis will issue an error message such as "No convergence in DC analysis", "Singular Matrix", or "Source Stepping Failed". PSpice will then halt the run because both the AC and transient analyses require an initial stable operating point in order to proceed. During the transient analysis, this iterative process is repeated for each individual time step. If the node voltages do not settle down, the time step is reduced and PSpice tries again to determine the node voltages. If the time step is reduced beyond a specific fraction of the total analysis time, the transient analysis will issue the error message, "Time step too small," and the analysis will be halted.

Convergence problems come in all shapes, sizes, and disguises, but they are usually related to one of the following:

- Circuit Topology
- Device Modeling
- Simulator Setup

The DC analysis may fail to converge because of incorrect initial voltage estimates, model discontinuities, unstable/bistable operation, or unrealistic circuit impedances. Transient analysis failures are usually due to model discontinuities or unrealistic circuit, source, or parasitic modeling. In general, you will have problems if the impedances, or impedance changes, do not remain reasonable. Convergence problems will result if the impedances in your circuit are too high or too low.

The various solutions to convergence problems fall under one of two types. Some are simply band-aids which merely attempt to fix the symptom by adjusting the simulator options. Other solutions actually affect the true cause of the convergence problems.

The following techniques can be used to solve a large number of convergence problems. When a convergence problem is encountered, you should start at solution 0 and proceed with the subsequent suggestions until convergence is achieved. The sequence of the suggestions is structured so that they can be incrementally added to the simulation. The sequence is also defined so that the initial suggestions will be of the most benefit. Note that suggestions which involve simulation options may simply mask the underlying circuit instabilities. Invariably, you will find that once the circuit is properly modeled, many of the "options" fixes will no longer be required!

General Discussion

Many power electronics convergence problems can be solved with the .OPTIONS Gmin parameter. Gmin is the minimum conductance across all semiconductor junctions. The conductance is used to keep the matrix well conditioned. Its default value is 1E-12mhos. Setting Gmin to a value between 1n and 10n will often solve convergence problems. Setting Gmin to a value which is greater than 10n may cause convergence problems.

PSpice does not always converge when relaxed tolerances are used. One of the most common problems is the incorrect use of the .Options parameters. For example, setting the tolerance option, Reltol, to a value which is greater than .01 will often cause convergence problems.

Setting the value of Abstol to 1u will help in the case of circuits that have currents which are larger than several amps. Again, do not overdo this setting. Setting Abstol to a value which is greater than 1u may cause more convergence problems than it will solve.

After you've performed a number of simulations, you will discover the options which work best for your circuit. Very often various options will needed as the circuit topology is developed. Invariably, you will find that after you have debugged your circuit representation, and if your components are well modeled, most of the options can be removed.

If all else fails, you can almost always get a circuit to simulate in a transient simulation if you begin with a zero voltage/zero current state. This makes sense if you consider the fact that the simulation always starts with the assumption that all voltages and currents are zero. The simulator can almost always track the nodes from a zero condition. Running the simulation will often help uncover the cause of the convergence failure.

The above recommendation is only true if your circuit is constructed properly. Most of the time, minor mistakes are the cause of convergence problems. Error messages will help you track down the problems, however, a good technique is to scan each line of the netlist and look for anomalies. It may be tedious, but it’s a proven way to weed out mistakes.

Not all convergence failures are a result of the PSpice software! Convergence failures may identify many circuit problems. Check your circuits carefully, and don't be too quick to blame the software.

DC Convergence Solutions

0. Check the circuit topology and connectivity.

Common mistakes and problems:

- Make sure that all of the circuit connections are valid. Also, verify component polarity.
- Check for syntax mistakes. Make sure that you used the correct SPICE units (i.e. MEG instead of M(milli) for 1E6).
- Make sure that there is a DC path from every node to ground.
- Make sure that voltage/current generators use realistic values, especially for rise and fall time
- Make sure that dependent source gains are correct, and that E/G element expressions are reasonable. If you are using division in an expression, verify that division by zero cannot occur or protect against it with a small offset in the denominator.

1. Increase ITL1 to 400 in the .OPTIONS statement.

Example: .OPTIONS ITL1=400

This increases the number of DC iterations that PSpice will perform before it gives up. In all but the most complex circuits, further increases in ITL1 won’t typically aid convergence.

2. Add .NODESETs

Example: .NODESET V(6)=0

View the node voltage/branch current table in the output file. PSpice produces one even if the circuit does not converge. Add .NODESET values for the top level circuit nodes (not the subcircuit nodes) that have unrealistic values. You do not need to nodeset every node. Use a .NODESET value of 0V if you do not have a better estimation of the proper DC voltage. Caution is warranted, however, for an inaccurate Nodeset value may cause undesirable results.

3. Add resistors and use the OFF keyword.

```
Example:        D1   1  2  DMOD OFF
                RD1  1  2  100MEG
```

Add resistors across diodes in order to simulate leakage. Add resistors across MOSFET drain-to-source connections to simulate realistic channel impedances. This will make the impedances reasonable so that they will be neither too high nor too low. Add ohmic resistances (RC, RB, RE) to transistors. Use the .Options statement to reduce Gmin by an order of magnitude.

Next, you can also add the OFF keyword to semiconductors (especially diodes) that may be causing convergence problems. The OFF keyword tells PSpice to first solve the operating point with the device turned off. Then the device is turned on, and the previous operating point is used as a starting condition for the final operating point calculation.

4. Use PULSE statements to turn on DC power supplies.

```
Example: VCC  1  0 15 DC
becomes  VCC  1  0 PULSE 0 15
```

This allows the user to selectively turn on specific power supplies. This is sometimes known as the "Pseudo-Transient" start-up method. Use a reasonable rise time in the PULSE statement to simulate realistic turn on. For example,

```
V1  1  0  PULSE  0  5  0  1U
```

will provide a 5 volt supply with a turn on time of 1μs. The first value after the 5 (in this case, 0) is the turn-on delay, which can be used to allow the circuit to stabilize before the power supply is applied.

5. Add UIC (Use Initial Conditions) to the .TRAN statement.

```
Example: .TRAN .1N 100N UIC
```

Insert the UIC keyword in the .TRAN statement. Use Initial Conditions (UIC) will cause PSpice to completely bypass the DC analysis. You should add any applicable .IC and IC= initial conditions statements to assist in the initial stages of the transient analysis. Be careful when you set initial conditions, for a poor setting may cause convergence difficulties.

AC Analysis Note: Solutions 4 and 5 should be used only as a last resort, because they will not produce a valid DC operating point for the circuit (all supplies may not be turned on and circuit may not be properly biased). Therefore, you cannot use solutions 4 and 5 if you want to perform an AC analysis, because the AC analysis must be preceded by a valid operating point solution. However, if your goal is to proceed to the transient analysis, then solutions 4 and 5 may help you and may possibly uncover the hidden problems which plague the DC analysis.

Transient Convergence Solutions

0. Check circuit topology and connectivity.

This item is the same as item 0 in the DC analysis.

1. Set RELTOL=0.01 or 0.005 in the .OPTIONS statement.

Example: .OPTIONS RELTOL=0.01

This option is encouraged for most simulations, since the reduction of Reltol can increase the simulation speed by 10 to 50%. Only a minor loss in accuracy usually results. A useful recommendation is to set Reltol to 0.01 for initial simulations, and then reset it to its default value of .001 when you have the simulation running the way you like it and a more accurate answer is required. Setting Reltol to a value less than .001 is generally not required.

2. Set ITL4=500 in the .OPTIONS statement.

Example: .OPTIONS ITL4=500

This increases the number of transient iterations that SPICE will attempt at each time point before it gives up. Values which are greater than 500 or 1000 won't usually bring convergence.

3. Reduce the accuracy of ABSTOL/VNTOL if current/voltage levels allow it.

Example: . OPTION ABSTOL=1N VNTOL=1M

Abstol and Vntol should be set to about 8 orders of magnitude below the level of the maximum voltage and current. The default values are Abstol=1p and Vntol=1u. These values are generally associated with IC designs.

4. Realistically Model Your Circuit; add parasitics, especially stray/junction capacitance.

The idea here is to smooth any strong nonlinearities or discontinuities. This may be accomplished via the addition of capacitance to various nodes and verifying that all semiconductor junctions have capacitance. Other tips include:

- Use RC snubbers around diodes.
- Add capacitance for all semiconductor junctions (3pF for diodes, 5pF for BJTs if no specific value is known).
- Add realistic circuit and element parasitics.
- Watch the real-time waveform display and look for waveforms that transition vertically (up or down) at the point during which the analysis halts. These are the key nodes which you should examine for problems.
- If the .Model definition for the part doesn't reflect the behavior of the device, use a subcircuit representation. This is especially important for RF and power devices such as RF BJTs and power MOSFETs. Many model vendors cheat and try to "force fit" the SPICE .MODEL statement in order to represent a device's behavior. This is a sure sign that the vendor has skimped on quality in favor of quantity. Primitive level 1 or 3 .MODEL statements CAN NOT be used to model most

devices above 200MEGHz because of the effect of package parasitics. And .MODEL statements CAN NOT be used to model most power devices because of their extreme nonlinear behavior. In particular, if your vendor uses a .MODEL statement to model a power MOSFET, throw away the model. It's almost certainly useless for transient analysis.

5. Reduce the rise/fall times of the PULSE sources.

```
Example:    VCC  1  0  PULSE  0  1  0  0   0
becomes     VCC  1  0  PULSE  0  1  0  1U  1U
```

Again, we are trying to smooth strong nonlinearities. The pulse times should be realistic, not ideal. If no rise or fall time values are given, or if 0 is specified, the rise and fall times will be set to the TSTEP value in the .TRAN statement.

6. Add UIC (Use Initial Conditions) to the .TRAN line.

Example: .TRAN .1N 100N UIC

If you are having trouble getting the transient analysis to start because the DC operating point can't be calculated, insert the UIC keyword in the .TRAN statement (skip initial transient solution). UIC will cause PSpice to completely bypass the DC analysis. You should add any applicable .IC and IC= initial conditions statements to assist in the initial stages of the transient analysis. Be careful when you set initial conditions, for a poor setting may cause convergence difficulties.

Modeling Tips

Device modeling is one of the hardest steps encountered in the circuit simulation process. It requires not only an understanding of the device's physical and electrical properties, but also a detailed knowledge of the particular circuit application. Nevertheless, the problems of device modeling are not insurmountable. A good first-cut model can be obtained from data sheet information and quick calculations, so the designer can have an accurate device model for a wide range of applications.

Data sheet information is generally very conservative, yet it provides a good first-cut of a device model. In order to obtain the best results for circuit modeling, follow the rule: "Use the simplest model possible." In general, the SPICE component models have default values that produce reasonable first order results. Here are some helpful tips:

- Don't make your models any more complicated than they need to be. Overcomplicating a model will only cause it to run more slowly, and will increase the likelihood of an error.
- Remember: modeling is a compromise.
- Don't be afraid to pull apart your circuit and test individual sections or even models, especially the ones you did not create.

- Create subcircuits which can be run and debugged independently. Simulation is just like being at the bench. If the simulation of the entire circuit fails, you should break it apart and use simple test circuits to verify the operation of each component or section.
- Document the models as you create them. If you don't use a model often, you might forget how to use it.
- Be careful when using models which have been produced by hardware vendors. Many have limitations on the operating point bounds for which they can be used.
- Semiconductor models should always include junction capacitance and the transit time (AC charge storage) parameters.
- If the .Model definition for a large geometry device doesn't reflect the behavior of the device, use a subcircuit representation.
- Be careful when using behavioral models for power devices. Many models are not thoroughly tested and work at one operating point but are highly inaccurate at other operating points.

- And lastly, there is no substitute for knowing what you're doing!!

Chapter 4 - Library Listings

Please see the file Power_Library_List_4.2.pdf for an electronic version of these listings.

An asterisk (*) or red entry in the left column indicates that the model has been recently added.

AEI SYSTEMS POWER IC MODEL LIBRARY LISTINGS - Release 4.3

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Power FET Drivers

Power MOS/IGBT Drivers	Vendor	Library	Part Description	Application Schematic File Name
IR2110	IR	IR_Driver	Hi and Lo Side Drivers	IR2110Test
IR2110S	IR	IR_Driver	Hi and Lo Side Drivers	IR2110STest
RIC7113	IR	IR_Driver	Hi and Lo Side Drivers	RIC7113Test
Si4724CY	Vishay	Vishay	N-Channel Synchronous MOSFETs with Break-Before-Make, See Si4724CY.pdf	SI4724CYTest
Si4768CY	Vishay	Vishay	N-Channel Synchronous MOSFETs with Break-Before-Make	SI4768CYTest
Si4770CY	Vishay	Vishay	N-Channel Synchronous MOSFETs with Break-Before-Make	SI4770CYTest
Sic710DD	Vishay	Vishay	Half-Bridge FET Driver	Sic710DD
Sic720DD	Vishay	Vishay	Half-Bridge FET Driver	SIC720DD
SiP41101	Vishay	Vishay	Half-Bridge FET Driver	SIP41101
HIP2100	Intersil	Intersil	100VDC – 2A Half Bridge Driver	HP2100Test
HIP2101	Intersil	Intersil	100V Half Bridge N-Channel	HP2101Test
HIP6601B	Intersil	Intersil	MOSFET Driver, Dual N-Channel	HP6601BTest
HIP6602B	Intersil	Intersil	Synchronous Rectified Buck MOSFET	HP6602BTest
MIC4416	Micrel	Micrel	1.2A-Peak Low-Side MOSFET Driver	
MIC4417	Micrel	Micrel	1.2A-Peak Low-Side MOSFET Driver	
MIC4420	Micrel	Micrel	6A-Peak Low-Side MOSFET Driver	
MIC4429	Micrel	Micrel	6A-Peak Low-Side MOSFET Driver	
MIC4421	Micrel	Micrel	9A-Peak Low-Side MOSFET Driver	
MIC4422	Micrel	Micrel	9A-Peak Low-Side MOSFET Driver	
MIC4421A	Micrel	Micrel	9A-Peak Low-Side MOSFET Driver	
MIC4422A	Micrel	Micrel	9A-Peak Low-Side MOSFET Driver	
MIC4423	Micrel	Micrel	3A-Peak Low-Side MOSFET Driver	
MIC4424	Micrel	Micrel	3A-Peak Low-Side MOSFET Driver	MIC4424, MICREL_Test
MIC4451	Micrel	Micrel	12A-Peak Low-Side MOSFET Driver	
MIC4452	Micrel	Micrel	12A-Peak Low-Side MOSFET Driver	
TPS2834	TI	TI_Power	Synchronous-Buck MOSFET Drivers With Deadtime Control	TPS2834_5_App
TPS2835	TI	TI_Power	Synchronous-Buck MOSFET Drivers With Deadtime Control	TPS2834_5_App
UCC37323	TI	TI_Power	Dual 4 A Peak High Speed Low-Side Power MOSFET Drivers	UCC37324 Test Circuit
UCC37324	TI	TI_Power	Dual 4 A Peak High Speed Low-Side Power MOSFET Drivers	UCC37324 Test Circuit
UCC37325	TI	TI_Power	Dual 4 A Peak High Speed Low-Side Power MOSFET Drivers	UCC37324 Test Circuit

Linear ICs

Linear	Vendor	Library	Part Description	Application Schematic File Name
AD524S	AD	ADI_Linear	Analog Multiplier, See AD524S.pdf	NA
AD534T	AD	ADI_Linear	Instrumentation Amp, See AD534T.pdf	NA
AD536A	AD	ADI_Linear	Integrated Circuit True RMS to DC Converter	AD536A Test dB, AD536A Test
AD636	AD	ADI_Linear	Low Level, True RMS to DC Converter	AD636C, AD636C_dB
AD637	AD	ADI_Linear	High Precision, Wideband RMS to DC Converter	dB Test, Test
AD736	AD	ADI_Linear	Low Cost, Low Power, True RMS to DC Converter	Test (AD736G)
AD737F	AD	ADI_Linear	Low Cost, Low Power, True RMS to DC Converter	Test (AD737F)
AD8000	AD	ADI_Linear	1.5 GHz, Ultra-High Speed Op Amp with Power-Down	AD8000 Test
AD8003	AD	ADI_Linear	Triple, 1.5 GHz Op Amp	AD8003
AD8099	AD	ADI_Linear	Op-amp, See AD8099.pdf	AD8099Test
AD8133	AD	ADI_Linear	Triple Differential Driver With Output Pull-Down	AD8133_Closed
AD8137	AD	ADI_Linear	Low Cost, Low Power 12-Bit Differential ADC Driver	AD8137
AD8139	AD	ADI_Linear	Ultra Low Noise Fully Differential ADC Driver	AD8139
AD8206	AD	ADI_Linear	Single-Supply 42V System Difference Amplifier	AD80206
AD8214	AD	ADI_Linear	High Voltage Threshold Detector	AD8214 Test
AD8330	AD	ADI_Linear	Low Cost DC to 150 MHz Variable Gain Amplifier	AD8330_App
AD8331, AD8331_LNA, AD8331_VGA	AD	ADI_Linear	Single VGA with Ultralow Noise Preamplifier and Programmable Rin	AD8331
AD8333	AD	ADI_Linear	DC to 50 MHz Dual I/Q Demodulator and Phase Shifter	ad8333p, AD8333TEST2, AD8333TEST3
AD8335	AD	ADI_Linear	Quad Low Noise, Low Cost Variable Gain Amplifier	AD8335_APP
AD8336	AD	ADI_Linear	General Purpose Wide-Bandwidth Variable Gain Amplifier	
AD8421	AD	ADI_Linear	Low Power Instrumentation Amplifier	
ADA4860	AD	ADI_Linear	High Speed, Low Cost, Op Amp	Test (ADA4860-1)
ADA4861	AD	ADI_Linear	High Speed, Low Cost, Triple Op Amp	Test (ADA4861-3)
ADA4862	AD	ADI_Linear	High Speed, G = +2, Low Cost, Triple Op Amp	Test (ADA4862-3)
REF43	AD	ADI_Linear	Low Power Precision Voltage Reference	

Power ICs

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
ISL6225	Intersil	Intersil	PWM Controller, Dual, Regulated Output Voltage 0.9V-5.5V	ISL6225Avg
ISL6520a	Intersil	Intersil	PWM Controller, +5V Input, VOUT 0.8V Min @ 1.5%, 300kHz	ISL6520ATRAN
ISL6520Assa	Intersil	Intersil	Average model	ISL6225AVG
ISL6721	Intersil	Intersil	Single-Ended Current Mode PWM controller	ISL6721TRAN
ISL6721Av	Intersil	Intersil	Single-Ended Current Mode PWM controller , Average model	ISL6721AVG
ISL6740	Intersil	Intersil	PWM controller for half bridge and bus converter, See ISL6740switching.pdf	NA
ISL6740av	Intersil	Intersil	Average model, See ISL6740average.pdf	ISL6740Avg
ISL6741av	Intersil	Intersil	PWM controller for hard-switched full bridge and push-pull applications, Average model	ISL6741Avg
ISL70444SEH	Intersil	ISL70444SEH_Nominal	19MHz Radiation Hardened 40V Quad Rail-to-rail Input-output, Low-power Operational Amplifier	modelcreator.opj
ISL71090SEH25	Intersil	isl71090seh25 stability	Radiation Hardened Ultra Low Noise, Precision Voltage Reference	isl71090seh25 stability.opj
ISL75051SRH	Intersil	ISL75051SRH_3p2VIN_2p5VOUT	3A, Radiation Hardened, Positive, Ultra-Low Dropout Regulator, 3.3V input, 2.5V output model. i2dparts.lib and i2dparts_analog.lib will need to be included for the simulation to netlist properly.	
ISL75051SRH	Intersil	ISL75051SRH_5VIN_2p5VOUT	3A, Radiation Hardened, Positive, Ultra-Low Dropout Regulator, 5V input, 2.5V output model. i2dparts.lib and i2dparts_analog.lib will need to be included for the simulation to netlist properly.	
ISL75051SRH	Intersil	ISL75051SRH_5VIN_3p3VOUT	3A, Radiation Hardened, Positive, Ultra-Low Dropout Regulator, 5V input, 3.3V output model. i2dparts.lib and i2dparts_analog.lib will need to be included for the simulation to netlist properly.	
LT1242	Linear Tech	LT_Power	High Speed Current Mode Pulse Width Modulators	LT1242Test
LT1242S	Linear Tech	LT_Power	State space average model	
LT1243	Linear Tech	LT_Power	High Speed Current Mode Pulse Width Modulators	LT1243
LT1243S	Linear Tech	LT_Power	State space average model	
LT1244	Linear Tech	LT_Power	High Speed Current Mode Pulse Width Modulators	LT1244
LT1244S	Linear Tech	LT_Power	State space average model	
LT1245	Linear Tech	LT_Power	High Speed Current Mode Pulse Width Modulators	LT1245
LT1245S	Linear Tech	LT_Power	State space average model	
ML4863	Microlinear	Microlinear	Boost Regulators for Battery Powered Applications	ML4863Test

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
RH1021-7	Linear Tech	LT_Power	Precision 7V Reference	RH1021-7_Shunt
RH1021-10	Linear Tech	LT_Power	Precision 10V Reference	RH1021-10_Shunt
TPS2490	TI	TPS2490 (in Examples\TI\TPS2490)	POS HIGH-VOLT POWER-LIMITING HOTSWAP	SLVS503B
TPS2491	TI	TPS2491 (in Examples\TI\TPS2491)	POS HIGH-VOLT POWER-LIMITING HOTSWAP	SLVS503B
TPS2492	TI	TPS2492 (in Examples\TI\TPS2492)	POS HIGH-VOLT POWER-LIMITING HOTSWAP	SLVS503B
TPS2493	TI	TPS2493 (in Examples\TI\TPS2493)	POS HIGH-VOLT POWER-LIMITING HOTSWAP	SLVS503B
TL494	TI	TI_Power	PWM Control Circuit	TL494 STEADY STATE, TL494 STARTUP
TL494avg	TI	TI_Power	Average TL494 model	TL494AVG BODE
TPS40007	TI	TI_Power	Synchronous Buck,300kHz	TPS40007_APP
TPS40007Avg	TI	TI_Power	Synchronous Buck,300kHz Average model	TPS40007AVG
TPS40009	TI	TI_Power	Synchronous Buck,600KHz	TPS40009
TPS40009Avg	TI	TI_Power	Synchronous Buck,600KHz	TPS40009AVG
TPS40040	TI	TI_Power	Synchronous Buck Converter,300kHz	TPS40040_1_APP
TPS40040Avg	TI	TI_Power	Synchronous Buck Converter,300kHz State-Space Average model	TPS40040avg
TPS40041	TI	TI_Power	Synchronous Buck Converter,600kHz	TPS40040_1_APP
TPS40041Avg	TI	TI_Power	Synchronous Buck Converter,600kHz State-Space Average model	TPS40041avg
TPS40042	TI	TPS40042 (in Examples\TI\TPS40042)	Low Pin Count, Low Vin, Synchronous Buck DCDC Controller with Tracking	tps40042
TPS40055	TI	TI_Power	Wide-Input Synchronous Buck Controller	TPS40055
40055MOD2	TI	TI_Power	State Space Model	TPS40055_SSA
TPS40060	TI	TI_Power	Wide-Input Synchronous Buck Controller	TPS40060_AppV2
TPS40060_Avg	TI	TI_Power	Wide-Input Synchronous Buck Controller State-Space Average model	TPS40060 Average
TPS40061	TI	TI_Power	Wide-Input Synchronous Buck Controller	TPS40061_AppV2
TPS40061_Avg	TI	TI_Power	Wide-Input Synchronous Buck Controller State-Space Average model	TPS40061 Average
TPS40075	TI	TI_Power	Midrange Input Synchronous Buck Controller With Voltage Feed-Forward	TPS40075_APPV1
TPS40075avg	TI	TI_Power	Midrange Input Synchronous Buck Controller With Voltage Feed-Forward State-Space Average model	TPS40075 Average Packaged
TPS40090	TI	TI_Power	High Frequency Multi-phase Controller; Parameter TRI=1	TPS40090_1_APP
TPS40090avg	TI	TI_Power	High Frequency Multi-phase Controller State-Space Average model	TPS40090avg
TPS40091 (use 40090, Set TRI = 0)	TI	TI_Power	High Frequency Multi-phase Controller; The only difference between the two models is that the passed model parameter TRI=1 for TPS40090 (disables tri-state feature) and TRI=0 for the TPS40091 (enables tri-state feature).	TPS40090_1_APP (average same as '090)
TPS40140	TI	TPS40140 (in Examples\TI\TPS40140)	Stackable 2 Channel Multiphase or 2 Channel Independent Output Controller	tps40140
TPS40170	TI	TPS40170 (in Examples\TI\TPS40170)	Stackable 2 Channel Multiphase or 2 Channel Independent Output Controller	tps40180
TPS40180	TI	TPS40180 (in Examples\TI\TPS40180)	Stackable 2 Channel Multiphase or 2 Channel Independent Output Controller	tps40180
TPS40190	TI	TI_Power	Synchronous Buck Converter	SLUU232
TPS40190Avg	TI	TI_Power	Synchronous Buck Converter Average Model	TPS40190avg
TPS40192	TI	TI_Power	Synchronous Buck w/P Good, 600KHz Separate State-Space Average model simulation provided	TPS40192_AppV4, TPS40192AVG
TPS40193	TI	TI_Power	Synchronous Buck w/pP Good ,300KHz Separate State-Space Average model simulation provided	TPS40193_APPV3, TPS40193 AVG
TPS40195	TI	TI_Power	Synchronous Buck w/P Good and Sync Separate State-Space Average model simulation provided	TPS40195_SubV2, Average
TPS40200	TI	TI_Power	Wide-Input Non-Synchronous Buck Controller	APPLICATION (requires tps40200app.lib)
TPS40200_avg	TI	TI_Power	Wide-Input Non-Synchronous Buck Controller State-Space Average model	TPS40200 average
TPS40210_0	TI	TI_Power	Current Mode Boost	LED_Application, TPS40210 Boost App
TPS40210Avg	TI	TI_Power	Current Mode Boost State-Space Average model	TPS40210AVG
TPS40211	TI	TPS40211 (in Examples\TI\TPS40211)	Wide Input Range Current Mode Boost Controller	tps40211_trans_steady
TPS40211_Startup	TI	TPS40211 (in Examples\TI\TPS40211)	Wide Input Range Current Mode Boost Controller	tps40211_trans_start
TPS40211Avg	TI	TPS40211 (in Examples\TI\TPS40211)	Wide Input Range Current Mode Boost Controller State Space Average Model	tps40211_avg
TPS40222	TI	TI_Power	1.6A 1.25Mhz Buck State-Space Average model	TPS40222NEW
TPS40222_Avg	TI	TI_Power	1.6A 1.25Mhz Buck State-Space Average model	TPS40222_AVG
TPS40303	TI	TPS40303 (in Examples\TI\TPS4030x\TPS40303_PSPICE_TRANS)	3V to 20V Wide Input Synchronous Buck Controller for High Power Density	TPS40303
TPS40304	TI	TPS40304 (in Examples\TI\TPS4030x\TPS40304_PSPICE_TRANS)	3V to 20V Wide Input Synchronous Buck Controller for High Power Densit	TPS40304
TPS40305	TI	TPS40305 (in Examples\TI\TPS4030x\TPS40305_PSPICE_TRANS)	3V to 20V Wide Input Synchronous Buck Controller for High Power Density	TPS40305

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
TPS51100	TI	TI_Power	3A Sink/Source DDR Regulator	TPS51100_APP (two versions, one for AC, one for Transient)
TPS51103	TI	TPS51113 (in Examples\TI\TPS51103)	Integrated LDO with switchover circuit for notebook computers	tps51103
TPS51113	TI	TPS51113 (in Examples\TI\TPS51113)	4.5V to 13.2V Synchronous Buck Controller with High Current Gate Driver, 300kHz	tps51113
TPS51116	TI	TPS51116 (in Examples\TI\TPS51116)	DDR1, DDR2, DDR3 Switcher and LDO	tps51116
TPS51117	TI	TI_Power	Synchronous Step-down On-Timer Controller	TPS51117 Steady State,TPS51117 Start UP
TPS51120	TI	TPS51120 (in Examples\TI\TPS51120)	Dual Current Mode, Synch Step-Down Controller With 100-mA Standby Regulator	tps51120
TPS51123	TI	TPS51123 (in Examples \TI\TPS51123\TPS51123_PSPICE_TRANS)	Dual-Synchronous, Step-Down Controller w/ Out-of-Audio Operation, 100-mA LDO	tps51123
TPS51124A	TI	TI_Power	Synchronous Step-down On-Timer Controller	
TPS51124H	TI	TI_Power	Synchronous Step-down On-Timer Controller	BUCK_EVM_SLUU252, INTEL
TPS51125	TI	TPS51125 (in Examples \TI\TPS51125\TPS51125_PSPICE_TRANS)	Dual-Synchronous, Step-Down Controller with Out-of-AudioT Operation and 100-mA LDOs	TPS51125_trans
TPS51125_Avg	TI	TPS51125 Average (in Examples \TI\TPS51125\TPS51125_PSPICE_AVG)	Dual-Synchronous, Step-Down Controller with Out-of-AudioT Operation and 100-mA LDOs	TPS51125avg
TPS51163	TI	TPS51163 (in Examples\TI\TPS51163)	4.5V to 13.2V Synchronous Buck Controller with High Current Gate Driver, 600kHz	tps51163
TPS51200	TI	TI_Power	Sink/Source DDR Termination Regulator	TPS51200_APP, TPS51200_AVG
TPS51211	TI	TPS51211 (in Examples\TI\TPS51211)	High-Performance, Single Synchronus, Step Down Controller for notebook power supply	TPS51217
TPS51217	TI	TPS51217 (in Examples\TI\TPS51217)	High-Performance, Single Synchronus, Step Down Controller for notebook power supply	TPS51217
TPS51218	TI	TPS51218 (in Examples \TI\TPS51218\TPS51218_PSPICE_TRANS)	3V to 28V Input. 20A Synchronous Step Down Controller	TPS51218
TPS51220A	TI	TPS51220A (in Examples\TI\TPS51220A)		
TPS51315	TI	TPS51315 (in Examples\TI\TPS51315)	3V to 14V, 10A Synchronous Step Down Converter with D-CAP™ Mode	tps51315
TPS51427	TI	TPS51427 (in Examples \TI\TPS51427A)	Dual D-CAP synchronous step-down controller	TPS51427
TPS51427A	TI	TPS51427A (in Examples\TI\TPS51427A)	DUAL D-CAP SYNCHRONOUS STEP-DOWN CONTROLLER	SLUS843B
TPS53219	TI	TPS53219 (in Examples\TI\TPS53219)	a 3-A Eco-mode integrated switcher	SLUSA41
TPS53311	TI	TPS53311 (in Examples\TI\TPS53311)	a 3-A Eco-mode integrated switcher	SLUSA41
TPS54010	TI	TPS54010 (in Examples \TI\TPS54010\TPS54010_PSPICE_TRANS)	2.2V-4.0V, 14A Synchronous Step Down SWIFT™ Converter	TPS54010
TPS54040	TI	TPS54040 (in Examples\TI\TPS54040)	3.5V to 42V Input, 0.5 A Step Down SWIFT™ Converter with Eco-Mode™	tps54040
TPS54060	TI	TPS54060 (in Examples\TI\TPS54060)	3.5V to 60V Input, 0.5A, 2.5MHz Step Down SWIFT™ Converter with Eco-Mode™	tps54060
TPS54110	TI	TPS54110 (in Examples \TI\TPS54110\TPS54110_PSPICE_TRANS)	Low Input Voltage 1.5A Step Down SWIFT™ Converter with Adjustable Output Voltage	tps54110
TPS54140	TI	TPS54140 (in Examples\TI\TPS54140)	3.5V to 42V Input, 1.5 A Step Down SWIFT™ Converter with Eco-Mode ™	tps54140
TPS54160	TI	TPS54160 (in Examples\TI\TPS54160)	3.5V to 60V, 1.5A Step Down SWIFT™ Converter with Eco-Mode™	tps54160
TPS54218	TI	TPS54218 (in Examples\TI\TPS54218)	Synchronous Step Down Switcher with Integrated FETs	SLVS974
TPS54225	TI	TPS54225 (in Examples\TI\TPS54225)	SWIFT Regulator	SLVSA15B
TPS54226	TI	TPS54226 (in Examples\TI\TPS54226)	SWIFT Regulator	SLVSA14C
TPS54227	TI	TPS54227 (in Examples\TI\TPS54227)	SWIFT Regulator	SLVSA14C
TPS54240	TI	TPS54240 (in Examples\TI\TPS54240)	3.5V TO 42V Step Down Converter	SLVSAA6
TPS54260	TI	TPS54260 (in Examples\TI\TPS54260)	3.5V TO 42V Step Down Converter	SLVSA86
TPS54283	TI	TI_Power	Non Synchronous Converter W/integrated HS FET,300kHz 2A State-Space Average model	3P3V AVERAGE, 5V AVERAGE
TPS54286	TI	TI_Power	Non Synchronous Converter W/integrated HS FET,600kHz 2A State-Space Average model	3P3V AVERAGE, 5V AVERAGE
TPS54290	TI	TPS54290 (in Examples \TI\TPS54290\TPS54290_PSPICE_TRANS)	4.5V to 18V Input, 1.5/2.5A, 300 kHz Dual Synchronous Step Down SWIFT™ Converter	tps54290
TPS54291	TI	TPS54291 (in Examples \TI\TPS54291\TPS54291_PSPICE_TRANS)	4.5V to 18V Input, 1.5/2.5A, 600 kHz Dual Synchronous Step Down SWIFT™ Converter	tps54291
TPS54292	TI	TPS54292 (in Examples \TI\TPS54292\TPS54292_PSPICE_TRANS)	4.5V to 18V Input, 1.5/2.5A, 1.2 MHz Dual Synchronous Step Down SWIFT™ Converter	tps54292
TPS54310	TI	TPS54310 (in Examples \TI\TPS54310\TPS54310_PSPICE_TRANS)	3V to 6V, 3A Synchronous Step Down SWIFT™ Converter	tps54310
TPS54311	TI	TPS54311 (in Examples\TI\TPS54311)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54312	TI	TPS54312 (in Examples\TI\TPS54312)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54313	TI	TPS54313 (in Examples\TI\TPS54313)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54314	TI	TPS54314 (in Examples\TI\TPS54314)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54315	TI	TPS54315 (in Examples\TI\TPS54315)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	TPS54315 Start UP
TPS54316	TI	TPS54316 (in Examples\TI\TPS54316)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54319	TI	TPS54319 (in Examples\TI\TPS54319)	2.95V TO 6V Step Down Converter	SLVSA83
TPS54325	TI	TPS54325 (in Examples\TI\TPS54325)	SWIFT Regulator	SLVS932A
TPS54326	TI	TPS54326 (in Examples\TI\TPS54326)	SWIFT Regulator	SLVU300
TPS54327	TI	TPS54327 (in Examples\TI\TPS54327)	SWIFT Regulator	SLVU300
TPS54328	TI	TPS54328 (in Examples\TI\TPS54328)	SWIFT Regulator	SLVU300

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
TPS54383	TI	TI_Power	Non Synchronous Converter W/integrated HS FET,300kHz 3A Separate State-Space Average model simulation provided	TPS54x8x, TPS54383AVG5V
TPS54386	TI	TI_Power	Non Synchronous Converter W/integrated Hs FET,600KHz 3A State-Space Average model	3P3V AVERAGE, 5V AVERAGE
TPS54418	TI	TPS54418 (in Examples\TI\TPS54418)	2.95V to 6V Input, 4A, 2MHz Synchronous Step Down SWIFT™ DCDC Converter	tps54418_trans
TPS54425	TI	TPS54425 (in Examples\TI\TPS54425)	SWIFT Regulator	SLVSA84A
TPS54426	TI	TPS54426 (in Examples\TI\TPS54426)	SWIFT Regulator	SLVSA84A
TPS54429	TI	TPS54429 (in Examples\TI\TPS54429)	SWIFT Regulator	SLVSA84A
TPS54429E	TI	TPS54429E (in Examples\TI\TPS54429E)	SWIFT Regulator	SLVSA84A
TPS54610	TI	TPS54610 (in Examples \TI\TPS54610\TPS54610_PSPICE_TRANS	3V to 6V, 6A Synchronous Step Down SWIFT™ Converter	tps54610
TPS54611	TI	TPS54611 (in Examples\TI\TPS54611)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS400C
TPS54612	TI	TPS54612 (in Examples\TI\TPS54612)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS400C
TPS54613	TI	TPS54613 (in Examples\TI\TPS54613)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS400C
TPS54614	TI	TPS54614 (in Examples\TI\TPS54614)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54615	TI	TPS54615 (in Examples\TI\TPS54615)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54616	TI	TPS54616 (in Examples\TI\TPS54616)	3V-6V, 3A OUTPUT SYNC BUCK w/ INTEGRATED FETs	SLVS416B
TPS54620	TI	TPS54620 (in Examples \TI\TPS54620\TPS54620_PSPICE_TRANS	4.5V to 17V Input, 6A Synchronous Step Down SWIFT™ Converter	tps54620_trans
TPS54622	TI	TPS54622 (in Examples \TI\TPS54622\TPS54622_PSPICE_TRANS	4.5V to 17V Input, 6A Synchronous Step Down SWIFT™ Converter	tps54620_trans
TPS54810	TI	TPS54810 (in Examples \TI\TPS54810\TPS54810_PSPICE_TRANS	5V Input 8A Synchronous Buck Converter with Adjustable Output Voltage	tps54810
TPS54910	TI	TPS54910 (in Examples \TI\TPS54910\TPS54910_PSPICE_TRANS	3V to 4V, 9A Synchronous Step Down SWIFT™ Converter	tps54910
TPS55383_Avg	TI	TPS55383 (in Examples \TI\TPS55383\TPS55383_PSPICE_AVG)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 300 kHz	tps55383avg3v3, tps55383avg5v
TPS55383	TI	TPS55383 (in Examples \TI\TPS55383\TPS55383_PSPICE_TRANS)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 300 kHz	tps55383
TPS55386_Avg	TI	TPS55383 (in Examples \TI\TPS55383\TPS55383_PSPICE_AVG)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 600 kHz	tps55386avg3v3, tps55386avg5v
TPS55386	TI	TPS55383 (in Examples \TI\TPS55383\TPS55383_PSPICE_TRANS)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 600 kHz	tps55386
TPS56121	TI	TPS56121 (in Examples \TI\TPS56121\TPS56121_PSPICE_TRANS)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 600 kHz	tps55386
TPS56221	TI	TPS56221 (in Examples \TI\TPS56221\TPS56221_PSPICE_TRANS)	3A, Dual Non-Synchronous Buck Converter w/ High-Side MOSFET and External Compensation, 600 kHz	tps55386
TPS61020	TI	TPS61020 (in Examples\TI\TPS61020)	Adjustable, 1.5-A Switch, 96% Efficient Boost Converter with Down-Mode, QFN-10	tps61020_trans
TPS61020_Avg	TI	TPS61020 (in Examples\TI\TPS61020)	Adjustable, 1.5-A Switch, 96% Efficient Boost Converter with Down-Mode, QFN-10 Average Model	tps61020avg
TPS61030	TI	TPS61030 (in Examples \TI\TPS61030\TPS61030_PSPICE_TRANS)	Adjustable, 4-A Switch, 96% Efficient Boost Converter	tps61030
TPS61031	TI	TPS61031 (in Examples \TI\TPS61031\TPS61031_PSPICE_TRANS)	3.3-V Output, 1-A, 96% Efficient Boost Converter	tps61031
TPS61032	TI	TPS61032 (in Examples \TI\TPS6102\TPS61032_PSPICE_TRANS)	5-V Output, 1-A, 96% Efficient Boost Converter	tps61032
TPS61040	TI	TPS61040 (in Examples\TI\TPS61040)	Evaluation Module	SLVS413E
TPS61041	TI	TPS61041 (in Examples\TI\TPS61041)	Evaluation Module	SLVS413E
TPS61085	TI	TPS61085 (in Examples \TI\TPS61085\TPS61085_PSPICE_TRANS)	18.5V, 2A, 650kHz / 1.2MHz Step-Up DC-DC Converter	tps61085
TPS61086	TI	TPS61086 (in Examples \TI\TPS61086\TPS61086_PSPICE_TRANS)	18.5V PFM/PWM High Efficiency Step-Up DC-DC Converter	tps61086
TPS61087	TI	TPS61087 (in Examples \TI\TPS61087\TPS61087_PSPICE_TRANS)	18.5V, 3.2A, 650kHz / 1.2MHz Step-Up DC-DC Converter	tps61087
TPS61170	TI	TPS61170 (in Examples \TI\TPS61170\TPS61170_PSPICE_TRANS)	18.5V, 3.2A, 650kHz / 1.2MHz Step-Up DC-DC Converter	tps61087
TPS62060	TI	TPS62060 (in Examples\TI\TPS62060)	3-MHz 1.6A Step Down Converter	SLVSA95
TPS62065	TI	TPS62065 (in Examples\TI\TPS62065)	3-MHz 2A Step Down Converter	SLVU364
TPS62067	TI	TPS62067 (in Examples\TI\TPS62067)	3-MHz 2A Step Down Converter	SLVS833A
TPS62120	TI	TPS62120 (in Examples\TI\TPS62120)	15V 75mA High Efficiency Buck Converter	SLVSAD5
TPS62122	TI	TPS62122 (in Examples\TI\TPS62122)	15V 75mA High Efficiency Buck Converter	SLVSAD5
TPS62230	TI	TPS62230 (in Examples\TI\TPS62230)	3-MHz Ultra-small step down converter	SLVU312
TPS62231	TI	TPS62231 (in Examples\TI\TPS62231)	3-MHz Ultra-small step down converter	SLVU312
TPS622310	TI	TPS622310 (in Examples\TI\TPS622310)	3-MHz Ultra-small step down converter	SLVU312
TPS622311	TI	TPS622311 (in Examples\TI\TPS622311)	3-MHz Ultra-small step down converter	SLVU312
TPS622312	TI	TPS622312 (in Examples\TI\TPS622312)	3-MHz Ultra-small step down converter	SLVU312
TPS622313	TI	TPS622313 (in Examples\TI\TPS622313)	3-MHz Ultra-small step down converter	SLVU312
TPS622314	TI	TPS622314 (in Examples\TI\TPS622314)	3-MHz Ultra-small step down converter	SLVU312
TPS622318	TI	TPS622318 (in Examples\TI\TPS622318)	3-MHz Ultra-small step down converter	SLVU312
TPS62232	TI	TPS62232 (in Examples\TI\TPS62232)	3-MHz Ultra-small step down converter	SLVU312
TPS62233	TI	TPS62233 (in Examples\TI\TPS62233)	3-MHz Ultra-small step down converter	SLVU312
TPS62234	TI	TPS62234 (in Examples\TI\TPS62234)	3-MHz Ultra-small step down converter	SLVU312
TPS62235	TI	TPS62235 (in Examples\TI\TPS62235)	3-MHz Ultra-small step down converter	SLVU312
TPS62236	TI	TPS62236 (in Examples\TI\TPS62236)	3-MHz Ultra-small step down converter	SLVU312
TPS62237	TI	TPS62237 (in Examples\TI\TPS62237)	3-MHz Ultra-small step down converter	SLVU312
TPS62238	TI	TPS62238 (in Examples\TI\TPS62238)	3-MHz Ultra-small step down converter	SLVU312
TPS62239	TI	TPS62239 (in Examples\TI\TPS62239)	3-MHz Ultra-small step down converter	SLVU312

TPS62240_Trans	TI	TPS6224x (in Examples\TI\TPS6224x)	2.25MHz 300mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62240_trans
TPS62242_Trans	TI	TPS6224x (in Examples\TI\TPS6224x)	2.25MHz 300mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62242_trans
TPS62243_Trans	TI	TPS6224x (in Examples\TI\TPS6224x)	2.25MHz 300mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62243_trans
TPS62260_Avg	TI	TI_Power	2.25MHz 600mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62260_Avg
TPS62260	TI	TI_Power	2.25MHz 600mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62260_trans
TPS62261	TI	TI_Power	2.25MHz 600mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62261_trans
TPS62262	TI	TI_Power	2.25MHz 600mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62262_trans
TPS62263	TI	TI_Power	2.25MHz 600mA Step-Down Converter in 2x2mm SON/TSOT23 Package	tps62263_trans
TPS62290	TI	TPS62290 (in Examples\TI\TPS6229x)	2.25MHz 1A Step-Down Converter in 2x2mm SON Package	tps62290_pspice_trans
TPS62291	TI	TPS62291 (in Examples\TI\TPS6229x)	2.25MHz 1A Step-Down Converter in 2x2mm SON Package	tps62291_trans
TPS62293	TI	TPS62293 (in Examples\TI\TPS6229x)	2.25MHz 1A Step-Down Converter in 2x2mm SON Package	tps62293_trans
TPS62410	TI	TPS62410 (in Examples \TI\TPS62410\TPS62410_PSPICE_TRANS)	2.25MHZ 2x800mA Dual Step-Down Converter with 1-Wire Interface in QFN	tps62410_trans
TPS62420_trans	TI	TPS62420 (in Examples \TI\TPS62420\TPS62420_PSPICE_TRANS)	Dual, Adjustable, 600mA and 1000mA, 2.25MHz Step-Down Converter with 1-Wire Interface in QFN	tps62420_trans
TPS62420_avg	TI	TPS62420 (in Examples \TI\TPS62420\TPS62420_PSPICE_AVG)	Dual, Adjustable, 600mA and 1000mA, 2.25MHz Step-Down Converter with 1-Wire Interface in QFN	tps62420_Avg
TPS62560	TI	TPS62560 (in Examples \TI\TPS62560\TPS62560_PSPICE_TRANS)	2.25MHz 600mA Step-Down Converter	tps62560_trans
TPS62561	TI	TPS62561 (in Examples \TI\TPS62561\TPS62561_PSPICE_TRANS)	2.25MHz 600mA Step-Down Converter	tps62561_trans
TPS62562	TI	TPS62562 (in Examples \TI\TPS62562\TPS62562_PSPICE_TRANS)	2.25MHz 600mA Step-Down Converter	tps62562_trans
TPS62590	TI	TPS62590 (in Examples \TI\TPS62590\TPS62590_PSPICE_TRANS)	2.25MHz, 1A Step-Down Converter	tps62590
TPS62650	TI	TPS62650 (in Examples\TI\TPS62650)	800mA 6MHz Step Down Converter	SLVS808
TPS63000	TI	TPS63000 (in Examples\TI\TPS63000)	96% Buck-Boost Converter with 1.8A Current Switches in 3x3 QFN	tps63000_trans
TPS63001	TI	TPS63001 (in Examples\TI\TPS63001)	96% Buck-Boost Converter with 1.7A Current Switches, 3.3V fixed Output voltage in 3x3 QFN	tps63001_trans
TPS63002	TI	TPS63002 (in Examples\TI\TPS63002)	96% Buck-Boost Converter with 1.7A Current Switches, 5V fixed Output voltage in 3x3 QFN	tps63002_trans
TPS63010	TI	TPS63010 (in Examples \TPS63010\TPS63010_PSPICE_TRANS)	High Efficient Single Inductor Buck-Boost Converter with 2-A Switches	tps63010_trans
TPS63010_Avg	TI	TPS63010 (in Examples \TI\TPS63010\TPS63010_PSPICE_AVG	High Efficient Single Inductor Buck-Boost Converter with 2-A Switches	tps63010_Avg
TPS63011	TI	TPS63011 (in Examples \TPS63011\TPS63011_PSPICE_TRANS)	High Efficient Single Inductor Buck-Boost Converter with 2-A Switches	tps63011_trans
TPS63012	TI	TPS63012 (in Examples \TPS63012\TPS63012_PSPICE_TRANS)	High Efficient Single Inductor Buck-Boost Converter with 2-A Switches	tps63012_trans
TPS63020	TI	TPS63020 (in Examples \TPS63020\TPS63020_PSPICE_TRANS)	High Efficiency Single Inductor Buck-Boost Converter with 4A Switch	tps63020_trans
TPS63021	TI	TPS63021 (in Examples \TPS63021\TPS63021_PSPICE_TRANS)	High Efficiency Single Inductor Buck-Boost Converter with 4A Switch	tps63021_trans
TPS65193	TI	TPS65193 (in Examples \TPS65193\TPS65193_PSPICE_TRANS)	Dual High-Voltage Scan Driver for TFT-LCD Transient Model	tps65193_trans
TPS65563_0	TI	TI_Power	Integrated Photo Flash Charger and IGBT Driver	tps65563
TPS7H1101	TI		1.5-V to 7-V Input, 3-A, Radiation-Hardened Ultra-Low Dropout (LDO) Regulator	tps7h1101_test.opj
UA723	TI	TI_Power	Precision Voltage Regulator	UA723Test
UC1524	TI	TI_Power	Advanced Regulating Pulse Width Modulators	UC1524Test
UC1524A	TI	TI_Power	Advanced Regulating Pulse Width Modulators	
UC1525	TI	TI_Power	Advanced Regulating Pulse Width Modulators	
UC1525A	TI	TI_Power	Advanced Regulating Pulse Width Modulators	
UC1637	TI	TI_Power	Switched Mode Controller for DC Motor Drive	UC1637SplitSupply, UC1637SingleSupply
UC1823	TI	TI_Power	High Speed PWM Controller	UC1823Test
UC1823A	TI	TI_Power	High Speed PWM Controller	
UC1824	TI	TI_Power	High Speed PWM Controller	UC1824Test
UC1825	TI	TI_Power	High Speed PWM Controller	UC1825Test
UC1825A	TI	TI_Power	High Speed PWM Controller	
UC1832	TI	TI_Power	Precision Low Dropout Linear Controller	UC1832_3_APP
UC1833	TI	TI_Power	Precision Low Dropout Linear Controller - See LoadStep Page	UC1832_3_APP
UC1842	TI	TI_Power	Current Mode PWM Controller	
UC1842A	TI	TI_Power	Current Mode PWM Controller	UC1842StateSpace, UC1842Test
UC1842AS	TI	TI_Power	State Space Average Model	
UC1842S	TI	TI_Power	State Space Average Model	
UC1843	TI	TI_Power	Current Mode PWM Controller	
UC1843A	TI	TI_Power	Current Mode PWM Controller	
UC1843AS	TI	TI_Power	State Space Average Model	UC1843ASTest
UC1843S	TI	TI_Power	State Space Average Model	

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
UC1844	TI	TI_Power	Current Mode PWM Controller	
UC1844A	TI	TI_Power	Current Mode PWM Controller	
UC1844AS	TI	TI_Power	State Space Average Model	
UC1844S	TI	TI_Power	State Space Average Model	
UC1845	TI	TI_Power	Current Mode PWM Controller	
UC1845A	TI	TI_Power	Current Mode PWM Controller	
UC1845AS	TI	TI_Power	State Space Average Model	
UC1845S	TI	TI_Power	State Space Average Model	
UC1846	TI	TI_Power	Current Mode PWM Controller	UC1846TRAN, UC1846_Package
UC1846SSA	TI	TI_Power	Current Mode PWM Controller State Space Average Model	
UC1847	TI	TI_Power	Current Mode PWM Controller	
UC1871	TI	TI_Power	Resonant Fluorescent Lamp Driver	UC1871Test
UC1872	TI	TI_Power	Resonant Fluorescent Lamp Ballast Controller	UC1872Test
UC1875	TI	TI_Power	Phase Shift Resonant Controller	UC1875Test
UC1876	TI	TI_Power	Phase Shift Resonant Controller	
UC1901	TI	TI_Power	Isolated Feedback Generator	UC1901
UC1901Avg	TI	TI_Power	Isolated Feedback Generator	UC1901 AVERAGE
UC3842B	On Semi	TI_Power	Current Mode, See UC384x.pdf	
UC3843B	On Semi	TI_Power	Current Mode, See UC384x.pdf	UC3843BFWD
UC3844B	On Semi	TI_Power	Current Mode, See UC384x.pdf	
UC3845B	On Semi	TI_Power	Current Mode, See UC384x.pdf	UC384XFlyback
UC3854Bs	TI	TI_Power	Enhanced High Power Factor Preregulator, State space	UC3854Test
UC3854s	TI	TI_Power	Enhanced High Power Factor Preregulator, State space	
UC39432	TI	TI_Power	Precision Analog Controller Same model for transient and AC simulations	uc39432_app
UCC1806	TI	TI_Power	Low Power, Dual Output, Current Mode PWM Controller	UCC1806Test
UCC27200	TI	UCC27200 (in Examples \TI\UCC27200)	120V Boot, 3-A Peak, High Frequency, High-Side/Low-Side Driver	UCC27200Test
UCC27201	TI	UCC27201 (in Examples \TI\UCC27201)	120V Boot, 3-A Peak, High Frequency, High-Side/Low-Side Driver	UCC27201Test
UCC28019	TI	TI_Power	Continuous conduction Mode PFC Same model for transient and AC simulations	UCC28019 Packaged, UCC28019Avg
UCC28070	TI	UCC27201 (in Examples \TI\UCC28070)	Two-Phase Interleaved CCM PFC Controller	UCC28070_App
UCC2813-0	TI	UCCX813-0 (in Examples\TI\UCCX813-X)	Low Power Economy BiCMOS Current Mode PWM	uccx813-0
UCC2813-1	TI	UCCX813-1 (in Examples\TI\UCCX813-X)	Low Power Economy BiCMOS Current Mode PWM	uccx813-1
UCC2813-2	TI	UCCX813-2 (in Examples\TI\UCCX813-X)	Low Power Economy BiCMOS Current Mode PWM	uccx813-2
UCC2813-4	TI	UCCX813-4 (in Examples\TI\UCCX813-X)	Low Power Economy BiCMOS Current Mode PWM	uccx813-4
UCC2813-5	TI	UCCX813-5 (in Examples\TI\UCCX813-X)	Low Power Economy BiCMOS Current Mode PWM	uccx813-5
UCC2817	TI	TI_Power	BiCMOS Power Factor Pre Regulator - Average Model Same model for transient and AC simulations	Startup, Bode
UCC2818	TI	TI_Power	BiCMOS Power Factor Pre Regulator - Average Model Same model for transient and AC simulations	Startup, Bode
UCC289x_Average	TI	UCC2891_AVG (in Examples\TI\UCC2891AVG	Current Mode Active Clamp PWM Controller State-Space Average model	UCC289xAvg
UCC2891	TI	TI_Power	Current Mode Active Clamp PWM Controller Generic State-Space Average model simulation provided	UC289X_App, UCC289xAvg
UCC2892	TI	TI_Power	Current Mode Active Clamp PWM Controller Generic State-Space Average model simulation provided	
UCC2893	TI	TI_Power	Current Mode Active Clamp PWM Controller Generic State-Space Average model simulation provided	UC289X_App, UCC289xAvg
UCC2894	TI	TI_Power	Current Mode Active Clamp PWM Controller Generic State-Space Average model simulation provided	UC289X_App, UCC289xAvg
UCC28C40	TI	TI_Power	BiCMOS Current Mode PWM	UCC28C40
UCC28C40s	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C41	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C41s	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C42	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C42s	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C43	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C43s	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C44	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C44s	TI	TI_Power	BiCMOS Current Mode PWM	UCC28C4X Average
UCC28C45	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28C45s	TI	TI_Power	BiCMOS Current Mode PWM	
UCC28600	TI	UCC28600	Quasi-Resonant Flyback Green-Mode Controller	
UCC3800	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM	
UCC3801	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM	
UCC3802	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM Separate State-Space Average model simulation provided	UCC3802, UCC3802EVM Steady State
UCC3803	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM Separate State-Space Average model simulation provided	UCC3803 EVM, UCC3803 EVM average
UCC3804	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM	
UCC3805	TI	TI_Power	Low-Power BiCMOS Current-Mode PWM	
UCC3809-1	TI	TI_Power	Economy Primary Controller	
UCC3809-2	TI	TI_Power	Economy Primary Controller including state space model Separate State-Space Average model simulation provided	FLYBACKStartup, FLYBACKSteady, FLYBACKLoop
UCC3895_Average	TI	UCC3895Average ((in Examples\TI\UCC3895	BiCMOS Advanced Phase Shift PWM Controller Separate State-Space Average model simulation provided	UCCx895_Average
UCC3895	TI	TI_Power	BiCMOS Advanced Phase Shift PWM Controller Separate State-Space Average model simulation provided	UCC3895Test, UCC3895, UCC3895 Transient

Power IC Models	Vendor	Library	Part Description	Application Schematic File Name
CAT3200HU2	On Semi	ON_Power	Low Noise Regulated Charge Pump DC-DC Converter	CAT3200HU2_Test
CS322	On Semi	ON_Power	High Speed PWM Controller	CS322Test
CS324	On Semi	ON_Power	High Speed PWM Controller	CS324Test
CS51220	On Semi	ON_Power	Feed Forward Voltage Mode PWM Controller with Programmable Synchronization	
CS51411	On Semi	ON_Power	1.5A, 260kHz Low Voltage Buck Regulators	CS51411Test
CS5155	On Semi	ON_Power	CPU 5-Bit Synchronous Buck Controller	CS5155Test
CS5165	On Semi	ON_Power	CPU 5-Bit Nonsynchronous Buck Controller	CS5165Test
CS5171	On Semi	ON_Power	1.5 A 280kHz Boost Positive Feedback Regulators	cs517x.dsn
CS5172	On Semi	ON_Power	1.5 A 280kHz Boost Negative Feedback Regulators	
CS5173	On Semi	ON_Power	1.5 A 560kHz Boost Positive Feedback Regulators	
CS5174	On Semi	ON_Power	1.5 A 560kHz Negative Feedback Boost Regulators	
CS5307	On Semi	ON_Power	Four-Phase VRM 9.0 Buck Controller	
CS5308	On Semi	ON_Power	Two-Phase PWM Controller with Integrated Gate Drivers for VRM 8.5	CS5308Test
CS5322	On Semi	ON_Power	Two-Phase Buck Controller with Integrated Gate Drivers and 5-Bit DAC	CS5322TEST
CS5323	On Semi	ON_Power	Three-Phase Buck Controller with 5-Bit DAC	
MC33063	On Semi	ON_Power	1.5A, Step-Up/Down/Inverting Switching Regulator	MC33063BOOSTTEST, MC33063BUCKTest
MC33161	On Semi	ON_Power	Universal Voltage Monitor	MC33161TEST
MC33201	On Semi	ON_Linear	Low Voltage, Rail-to-Rail, Single Operational Amplifier	MC3320XACTEST
MC33202	On Semi	ON_Linear	Low Voltage, Rail-to-Rail, Single Operational Amplifier	
MC33204	On Semi	ON_Linear	1V, Rail-to-Rail, Single Operational Amplifier	
MC33262	On Semi	ON_Power	Power Factor Controller	MC33262Test
MC33363	On Semi	ON_Power	High Voltage Switching Regulator	AF2
MC33501	On Semi	ON_Linear	1V, Rail-to-Rail, Single Operational Amplifier	MC3350XACTEST
MC33502	On Semi	ON_Linear	1V, Rail-to-Rail, Single Operational Amplifier	
MC33503	On Semi	ON_Linear	1V, Rail-to-Rail, Single Operational Amplifier	
MC34063	On Semi	ON_Power	3.4A, Step-Up/Down/Inverting Switching Regulator	MC34063 PSPICE, MC34063BUCKBOOSTTest
MC34163	On Semi	ON_Power	3.4A, Step-Up/Down/Inverting Switching Regulator	MC34163Test
NCP100	On Semi	ON_Power	Adjustable 0.9-6V ±1.7% Output Voltage 0.1-20mA Shunt Regulator	NCP100ACTest, NCP100PULSETest, NCP100SERIESPASS
NCP1000	On Semi	ON_Power	Fixed-100kHz Switching Regulator with 700V / 0.5A Switch	NCP1000Test
NCP1000A	On Semi	ON_Power	Fixed-100kHz Switching Regulator with 700V / 0.5A Switch, average model	NCP1000AVG#1, NCP1000AVG#2, NCP1000AVGTEST
NCP1001	On Semi	ON_Power	Fixed-100kHz Switching Regulator with 700V / 1A Switch	
NCP1002	On Semi	ON_Power	Fixed-100kHz Switching Regulator with 700V / 1.5A Switch	
NCP1203AV	On Semi	ON_Power	PWM Current-Mode Controller average model	
NCP1203P100	On Semi	ON_Power	100kHz PWM Current-Mode Controller for Universal Off-Line Supplies	
NCP1203P40	On Semi	ON_Power	40kHz PWM Current-Mode Controller for Universal Off-Line Supplies	NCP1203
NCP1203P60	On Semi	ON_Power	60kHz PWM Current-Mode Controller for Universal Off-Line Supplies	
NCP1400ASN19T1	On Semi	ON_Power	Up to 100mA, 1.9V, 180kHz Boost PWM Switching Regulator with Enable	NCP1400ASN19Test
NCP1400ASN30T1	On Semi	ON_Power	Up to 100mA, 3.0V, 180kHz Boost PWM Switching Regulator with Enable	NCP1400ASN30Test
NCP1400ASN50T1	On Semi	ON_Power	Up to 100mA, 5.0V, 180kHz Boost PWM Switching Regulator with Enable	NCP1400ASN50Test
NCP1570	On Semi	ON_Power	Low Voltage Synchronous Buck Controller	NCP1570Test
NCP1571	On Semi	ON_Power	Low Voltage Synchronous Buck Controller	NCP1571Test
NCP1653	On Semi	ON_Power	Compact, Fixed−Frequency, Continuous Conduction Mode PFC Controller	Switching
NCP1653Avg	On Semi	ON_Power	Compact, Fixed−Frequency, Continuous Conduction Mode PFC Controller	Average
NCS2003	On Semi	ON_Linear	Low Voltage, Rail-to-Rail Output Operational Amplifier	
NCS2006	On Semi	ON_Linear	Rail-to-Rail Input and Output, 3MHz Operational Amplifier	NCS2006
NCS2008	On Semi	ON_Linear	Rail-to-Rail Input and Output, 1.2MHz Operational Amplifier	NCS2008
NCS2009	On Semi	ON_Linear	Operational Amplifier, Rail-to-Rail Input and Output, 350 kHz	NCS2009
NCS210, NCS211, NCS212, NCS213, NCS214, NCS215	On Semi	ON_Linear	Current-Shunt Monitor, Voltage output, Bi-Directional Zero Drift	NCS21X
NCS2220A	On Semi	ON_Linear	Low Voltage Comparator	NCS2220A
NCS325	On Semi	ON_Linear	50 uV Offset, 0.25 uV/degC, 35 uA, Zero-Drift Operational Amplifier	
NCS333	On Semi	ON_Linear	Low Power Zero Drift Opamp	NCS333
NCS401	On Semi	ON_Linear	Current Shunt Monitor	NCS401
NCS5625	On Semi	ON_Linear	Dual Power Opamp	NCS5625
NCV4269	On Semi	ON_Power	Micropower 150mA LDO Linear Regulator	NCV4269 Line Transient, NCV4269 LoadTransient, NCV4269
NCV8403	On Semi	ON_Power	Self-Protected Low Side Driver with Temp and Current Limit, 42V, 14A	NCV8403Test
NCV952	On Semi	ON_Linear	Operational Amplifier, Low Power, Rail-to-Rail	NCV952
NCV952 24V	On Semi	ON_Linear	Operational Amplifier, Low Power, Rail-to-Rail (24V operation)	NVC952_24V
NLAS7213	On Semi	ON_Linear	DPST Switch	NLAS7213
TL431	On Semi	ON_Power	Adjustable 2.5-36V +/-1% Tolerance 1-100mA Shunt Regulator	LDOREGULATOR
TLV431	On Semi	ON_Power	Low Voltage Precision Adjustable Shunt Regulator	LDOREGULATOR, TLV431Test
LMV931	On Semi	ON_Linear	Low Voltage, Rail-to-Rail, Single Operational Amplifier	
NCS2001	On Semi	ON_Linear	Low Voltage, Rail-to-Rail, Single Operational Amplifier	
NCS2004	On Semi	ON_Linear	3.5MHz, Wide Supply, Rail-to-Rail Output Operational Amplifier	
NCS3402	On Semi	ON_Power	Dual Nano-power Open Drain Output Comparator	
LMV331	On Semi	ON_Linear	Comparator, Single General Purpose, Low Voltage	
LM339	On Semi	ON_Linear	Low Power, Low Offset Voltage, Dual Comparator	
LM393	On Semi	ON_Linear	Low Power, Low Offset Voltage, Dual Comparator	
HA16163	Renesas	Renesas	Synchronous Phase Shift Full-Bridge Control IC, 480 kHz, See Application Circuit.pdf	
LM4562	National	Nat_Linear	Dual-performance, high-fidelity audio operational amplifier	
LM117	National	Nat_LDO	3-terminal adjustable regulator	LM117, LM177_AC
LM120-XX	National	Nat_LDO	3-terminal negative regulators	
LM140-XX	National	Nat_LDO	3-terminal positive regulators	
LM78S40	National	Nat_Power	Universal Switching Regulator Subsystem	78S40Test
LP2953	National	National_LDO	Adjustable Micropower Low-Dropout Voltage Regulator, See LP2953A.pdf	LM2953ATest
TNY256	PI	PI_Power	*TinySwitch* with line under-voltage lockout, auto-restart	TNY256Test
HS117	Intersil	Intersil	Adjustable Voltage Regulator	HS117
OPA1652	TI	Misc	General Purpose, FET-input operational amplifier	
LTC2057	Linear Tech	Misc	General Purpose, Low Noise Zero-Drift operational amplifier	
RH101, RH6200	Linear Tech	RH_POWER	Low Noise, High Speed Rail-to-Rail Operational Amplifier	RH6200
RH1498	Linear Tech	RH_POWER	Dual Rail-to-Rail Input and Output Precision C-Load Op Amp	

Semiconductors

Semiconductors	Vendor	Library	Part Description	Application Schematic File Name
FETs: IRHLNJ797034, IRHMS597064, IRHNJ597130, IRHNJ57034, IRHLUB770Z4, IRHNM57110, IRHLNJ77034, IRHLUC770Z4	IR	IR_MOSFETS	Power Mosfet, refer to MOSFET Test Circuits to simulate parts	
FET: NVMFS5C442N	Onsemi	NVMFS5C442N	Power Mosfet, refer to MOSFET Test Circuits to simulate parts	
FET: DMP6023LE	Diodes Inc	DMP6023LE	Power Mosfet, refer to MOSFET Test Circuits to simulate parts	
FETs: 57034, 57130, 57230, IRF7466, IRF6216, IRF8113, IRF7828, IRF7832, IRF7834, IRFRC20, 2N7497T2, IRHF9130, IRHG53110, IRHLUB770Z4, IRHLUB7970Z4, IRHN3150, IRHNA597160, IRHNA9064, IRHNJ597130, IRHNM57110, JANSR2N7422, IRF830, 2N7471T1, IRL3705	IR	IR_Semi	Power Mosfets, See Improved Mosfet Model.pdf	
CMPD2004, CMPD3003, CMPD6001, CMDSH2-3, CMDSH-3, CMPD6263, CMHSH5-4, CMHSH5-2L, CMSH1-40M, CMSH1-60M, CMSH5-40, CMSH5-60, CMSH2-40M, CMSH2-60M, CSHD10-45L	CS	CS_Diodes	Diodes, General	
CCL0035, CCL0130, CCL0300, CCL0500, CCL0750, CCL1000, CCL1500, CCL2000, CCL2700, CCL3500, CCL4500, CCL5750, CCLH080, CCLH100, CCLH120, CCLH150	CS	CS_Current_Diodes	JFET Current Regulators	
CMPTA44, CMPTA94, CMPT404A, CJD44H11, CZTA44	CS	CS_BJTs	BJTs	
PD15_22B	Everlight	Misc	Silicon PIN Photodiode	
DQH03TZ600	PI	Misc	600V, 3A H-Series Power Factor Correction (PFC) Boost Diode	QH03TZ600_TestCircuits
EL301X, EL302X, EL305X	Everlight	Everlight Photocouplers	Random-Phase Triac Photocoupler	
ELM302X, ELM305X	Everlight	Everlight Photocouplers	Random-Phase Triac Photocoupler	
ELT302X, ELT305X	Everlight	Everlight Photocouplers	Random-Phase Triac Photocoupler	
EL303X, EL304X, EL306X, EL308X	Everlight	Everlight Photocouplers	Zero-Cross Triac Photocoupler	
ELM304X, ELM306X, ELM308X	Everlight	Everlight Photocouplers	Zero-Cross Triac Photocoupler	
ELT304X, ELT306X, ELT308X	Everlight	Everlight Photocouplers	Zero-Cross Triac Photocoupler	
EL06XX	Everlight	Everlight Photocouplers	Logic Gate Photocoupler	
ELM6XX	Everlight	Everlight Photocouplers	Logic Gate Photocoupler	
ELW137, ELW26XX	Everlight	Everlight Photocouplers	Logic Gate Photocoupler	
EL3120	Everlight	Everlight Photocouplers	Gate Driver Photocoupler	EL3120
ELW3120	Everlight	Everlight Photocouplers	Gate Driver Photocoupler	
EL045X, EL050X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL3H4-G	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min and Nom CTR	
EL816	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL20X, EL21X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min and Nom CTR	
EL3H7-G	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL101X-G	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min and Nom CTR	
CNY17-X, CNY17F-X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL111X-G	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL814 Series	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL817 Series	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL827	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min and Nom CTR	
EL852	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min and Nom CTR	
EL851	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
EL847	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
ELD3H7, ELQ3H7	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Min CTR	
ELM45X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Nom CTR	
ELW13X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Nom CTR	
ELW450X	Everlight	Everlight Photocouplers	Phototransistor Photocoupler, Nom CTR	
PT204-6B	Everlight	Everlight Photocouplers	Phototransistor Photocoupler	

Mi1020T	Marlow	Misc	Thermal-Electro Cooler, See TEC.pdf	
53259, 53111, 53124, 53253, 53250	Micropac	Micropac_Relays	Solid-State Relays, Switches, See 53111.pdf & 53250.pdf	53111Test, 53250Test
8CLJQ045_Sub	IR	IR_Semi	Power Schottky, See 8CLJQ045.pdf	
RHRP1540, RHRP1560	Fairchild	Misc	Soft Recovery Diode	
SSR8045P	SSDI	Misc	Power Schottky	
SFH615A-1, SFH615A-2, SFH615A-3, SFH615A-4	Vishay	Vishay	Optocoupler, Hi-Rel 5300Vrms	
SFH610A-1, SFH610A-2, SFH610A-3, SFH610A-4	Vishay	Vishay	Optocoupler, Hi-Rel 5300Vrms	
MOC8101, MOC8107, MOC8108	Fairchild	Misc	Optocoupler, Hi-Rel 5300Vrms	
6N136, 6N137	Everlight	Misc	Optocoupler, Hi-Speed 5000Vrms	
CNY17F-1, CNY17F-2, CNY17F-3, CNY17F-4	Fairchild	Misc	Optocoupler, Hi-Rel 5300Vrms	
HCPL_316J	Avago	Misc	2.5 Amp Gate Drive Optocoupler	
PS2501	CEL	Misc	Photocoupler, Hi-Speed 5000Vrms	
SKiiP28AC065V1	Semikron	Misc	3-Phase Bridge Inverter	
OD800W	Opto Diode Corp.	Misc	Hi-Rel Rad Hard IR Emitter	
SVC704	On Semi	Misc	Varactor Diode, Single, 16V, 50nA	
SVC710	On Semi	Misc	Varactor Diode, Single, 15V, 20nA	
SVC203C	On Semi	Misc	Varactor Diode, Dual, 16V, 50nA	
SVC272	On Semi	Misc	Varactor Diode, Dual, 14V, 50nA	
Misc BJTs: MPS750, MMBT2222ALT1, MMBT2907A, PN2222A, 2N2907A, 2N2222A, MMBT3904TT1, 2N4401, Q2N4033, Q2N2920, Q2N5153, Q2N5794, MMBT4403, 2N3700, 2N3019, 2N4399, Q2N3506, Q2N2219AL, 2N6059		Misc	BJTS	
Misc FETs: MTD1N60E, MTD3022T4, HAT2168H, HAT2167H, HUF75345S3S, Si7415DN, PH2525L, PH5525L, HAT2165, Si7846DP, FDS6898A, SI4866DY, SI4862DY, Si7366DP, Si7866ADP, SI4840DY, Si7860ADP, Si7880ADP, FRF9250, FQD2N100		Misc	Power Mosfets	
Misc Diodes: 1N4001, 1N4148, 1N5617, 1N5806, 1N5819, 1N6642US, 1N752a, 30BQ040, B240, BAS16L, BAS19, BAS21, BAT54H, BAT54S, BAT54T1, BZX84C12, BZX84C13, BZX84C5V1, BZX84C8V2, ES1A-ES1M, KBPC806, KBPC808, MA2ZD18, MBR140p2, MBR1645, MBR20100CT, MBR320, MBR330, MBR340, MBR350, MBR360, MBRS330T3, MUR1620, MUR260, MURA110rl, MURS120T3, MURS160, MURS260, RB081L20, SSR8045, UPR10, VDZT2R12B, BZX84C6V2, BAT54C, 1N6638, 1N5469a, 1N3595, 1N5615, 1N5711, 1N6622, 1N6640, 1N6642, 1N6677UR, MX028, MX041, D1N6659, RB521S30T1G, 1N5712		Misc	Diodes	
Misc Zener Diodes *: 1N4002, 1N4003, 1N4004, 1N4005, 1N4006, 1N4007, D1N5400, D1N5401, D1N5402, D1N5403, D1N5404, D1N5405, D1N5406, D1N5407, D1N5408, 1N4099, 1N4100, 1N4101, 1N4102, 1N4103, 1N4104, 1N4105, 1N4106, 1N4107, 1N4108, 1N4109, 1N4110, 1N4111, 1N4112, 1N4113, 1N4573A, 1N4574A, 1N4962, 1N5530, 1N5531, 1N5532, 1N5533, 1N5534, 1N5535, 1N5536, 1N5537, 1N5538, 1N5539, 1N5540, 1N6309, D1N4623, 1N5256B, 1N6633, 1N4617, 1N4466		Misc	Zener Diodes	
Misc LEDs: 0p2W_Red_LED, 0p2W_White_LED, 0p5W_Red_LED, 0p5W_White_LED, LTST-C150GKT, GM1JS35200, TLRF1060, LT1E40A, GM5SAE30P0A, IR12_21C, HIR83_01B, HIR89_01C, HIR91_01C, IR19_21C, IR204_H16_L10		Misc	LEDs	

Capacitors and Resistors

Capacitors and Resistors	Vendor	Library	Part Description	Parameters
WSL20102L000FEA	Vishay	Misc	Power metal strip resistor, 0.002ohms 1/2W	
Tantalum Capacitors: 06014-0242H, CWR09FC156KCC, CWR09FC336KCB, CWR09FC475KCC, CWR09FC476KCC, CWR09HC106KCC, CWR09JB474MCC, CWR09JC156KB, CWR09KC105MCC, CWR09KC106JB, CWR09KC106KCB, CWR09MC105KCC, CWR09MC474KCA, CWR09MC475KCC, CWR09NC104KB, CWR09NC105KCC, CWR09NC475KCC, CWR11FH476KCC, CWR11MH335KB, CWR11MH475KD, CWR19FC227KCHC, CWR19MB106KCHC, CWR29FC106KCBC, CWR29FC157KCHC, CWR29FC225KCBC, CWR29FC227KCHC, CWR29FC227KTHC, CWR29FH476KDFC, CWR29HC106KCDC, CWR29HH336KDFC, CWR29JC335KCDC, CWR29JH685KDFC, CWR29KC336KCHC, CWR29MC105KCDC, CWR29MC106KCHC, CWR29MC156KCXC, M39003_10_2114S, M39006_22_0525H, M39006_22_0571, M39006_22_0640, M39066_31_0154H, TAZH227K010LBMC0824		Misc	Tantalum Capacitors	
Tantalum Capacitors: T429X476M020, T541D157M010AH6510, T541X157M016AH6520, T541X476M035AH6510, CWR29HC226KTFC, T429H476M020AH4250, T541X337M016AH6520, T540B226M010AH6510, T540D476M016AH6520, T541X337M010AH6530, T540D107M016AH6510, T541D157M010AH4831, T429B106M010AH4250, CWR15FK106MTRC, T419G476M015AH4250, T541X106M063AH6530, TBME157K016L		Misc	Tantalum Capacitors	
Misc MOV's: V480LA7P. V420LA7P. V385LA7P, V320LA7P, MOV-07D821K, MOV-07D781K, MOV-07D751K, MOV-07D681K, MOV-07D621K, MOV-07D561K, MOV-07D511K, MOV-07D471K, MOV20D431K, MOV20D471K	Littelfuse	Misc	Metal Oxide Varistors (MOVs), Littlefuse LA Series, Bourns MOV-07D and MOV-20D Series	

Magnetics

Magnetics	Vendor	Library	Part Description	Parameters
MP55xxx	Magnetics	AEiMPP55	Molypermalloy Powder core models, Part numbers 55014 - 55933	
MP58xxx	Magnetics	AEiMPP58	High Flux powder core models, Part numbers 58018 - 58933	
MPP	Generic	Mags	Molypermalloy Powder (MPP) core model. See also MP55 Series	N= # of turns U= Permeability AL= Inductance reference of the core mHy/1000T^2 LM=Magnetic Path Length in cm DCR=Series resistance in ohms IC=Initial Conditions
MPP2	Generic	Mags	High Flux powder core model. See also MP58 Series	N= # of turns U= Permeability AL= Inductance reference of the core mHy/1000T^2 LM=Magnetic Path Length in cm DCR=Series resistance in Ohms
Core	Generic	Mags	Generic Saturable Core model. See Magnetics Modeling.pdf Ex. VSEC=25U IVSEC=-25U LMAG=10MHY LSAT=20UHY FEDDY=25KHZ	VSEC=Core Capacity in Volt-Sec IVSEC Initial Condition in Volt-Sec LMAG Magnetizing Inductance in Henries LSAT Saturation Inductance in Henries FEDDY Frequency when LMAG Reactance = Loss Resistance in Hz
CoreX	Generic	Mags	Generic Saturable Core model. See Magnetics Modeling.pdf	ACORE=Magnetic cross section area in cm2 LPATH=Magnetic path length in cm FEDDY=Frequency when Lmag Reactance=Loss resistance UMAX=Maximum Permeability, dB/dH USAT=Saturation Permeability, dB/dH BR=Flux density in gauss at H = 0 for saturated B-H loop BI=Initial Flux density, default = 0 N=Number of Turns
CorewHyst	Generic	Mags	Generic Saturable Core model. See Magnetics Modeling.pdf Ex. SVSEC=25U IHYST=10m IVSEC=1 LMAG=10MHY LSAT=20UHY RFEDDY=25KHZ	SVSEC=Volt-sec at Saturation = BSAT • AE • N IVSEC=Volt-sec Initial Condition = B • AE • N LMAG=Unsaturated Inductance = µO µR • N2 • AE / LM LSAT=Saturated Inductance = µO • N2 • AE / LM IHYST=Magnetizing I @ 0 Flux = H • LM / N REDDY=Eddy Current Loss Resistance
Transformers	Generic	Mags	Transformers, Various topologies, 1:1, Center tapped, etc.	Series resistance and turns ratio
Misc. Inductors *: HI2220P551R-10, HI2220P701R-10, M27-367-17, MI1206K601R-10, ISC1210ER1R0K, HRB1206S601		Misc	Inductors	
HRB1206S300, HRB1206S800, HRB1206S121, HRB1206S501	Generic	Bead	Ferrite Beads	
03024-22P, 03024-24P, 03024-25P, 03024-27P, 03024-27P-60mA	Generic	Bead	AEM Ferrite Beads	

MPP Core Model Note: The AEiMPP55.LIB and AEiMPP58.LIB model libraries contain individual models for various MPP55 and MPP58 Cores in the respective series. It is recommended that you use these individual models, as opposed to the generic MPP55 and MPP58 model versions. The parameters for the MPP55xxx and MPP58xxx models include N (the number of turns), DCR (DC resistance), and IC (initial condition).

Generic Model Templates

Generic Models				
Sandler State Space Average Models	**Vendor**	**Library**	**Description**	**Parameters**
Flyback	Generic	PowerSS	State Space average model for Flyback converters.	L=Primary inductance in Henries NC=Current transformer turns ratio NP=Power transformer turns ratio F=Switching frequency in Hz EFF=Efficiency RB=Current transformer burden resistor in ohms TS=Propagation delay time in the current loop in secs
Forward	Generic	PowerSS	State Space average model for Forward converters.	L=Primary inductance in Henries NC=Current transformer turns ratio NP=Power transformer turns ratio F=Switching frequency in Hz EFF=Efficiency RB=Current transformer burden resistor in ohms TS=Propagation delay time in the current loop in secs
Boost	Generic	PowerSS	State Space average model for Boost converters.	L=Primary inductance in Henries F=Switching frequency in Hz NC=Current transformer turns ratio NP=Power transformer turns ratio EFF=Efficiency RB=Current transformer burden resistor in ohms TS=Propagation delay time in the current loop in secs
Basso PWM Switching Models	**Vendor**	**Library**	**Description**	**Parameters**
PWMCCMVM	Generic	Basso	PWM switching model	RE=Parasitic resistance in Ohms
PWMDCMVM	Generic	Basso	PWM switching model	L=Primary inductance in Henries FS=Switching frequency in Hz
PWMVM	Generic	Basso	PWM switching model	L=Primary inductance in Henries FS=Switching frequency in Hz RE=Parasitic resistance in Ohms
PWMCM	Generic	Basso	PWM switching model	L=Primary inductance in Henries FS=Switching frequency in Hz RI=Current Sense Element SE=External ramp in V/s
PWMBCMVM	Generic	Basso	PWM switching model	L=Primary inductance in Henries
PWMBCMCM	Generic	Basso	PWM switching model	L=Primary inductance in Henries RI=Current Sense Element
PWMBCMCM2	Generic	Basso	PWM switching model	L=Primary inductance in Henries RI=Current Sense Element
Other Generic Models	**Vendor**	**Library**	**Part Description**	**Parameters**
3-phase	Generic	Misc	3-Phase Generator	F = Frequency in Hz PE = Phase A unbalance in degrees VRMS = RMS voltage VE = Phase A unbalance in rms volts DIR=Rotation direction (1 or -1) PO = Overall phase offset
CPWR	Generic	Misc	Constant Power Load	VKnee=Load is resistive below knee and then constant power for all voltages above that Power=Constant Power
Swhyste	Generic	Misc	Switch with hysteresis	Ron=On Resistance Roff=Off resistance VT=Threshold voltage (On/Off @ VT+VH, VT-VH) VH=Hysteresis voltage
CAT5	Generic	Misc	Category 5 Cable	L=Length in meters
DBEHAV	Generic	Misc	Soft Recovery Diode, See subcircuit netlist for more information	IS1, TM, TAU, RMO, VTA, CAP, ISE
Tant,	Generic	TantCap	Tantalum Capacitor Model with and w/o Initial Conditions, See Capacitor.pdf	C= capacitance ESR1K= ESR at 1kHz ESL=Series Inductance RLEAK=Leakage Resistance IC=Initial Conditions
DeadDrv	Generic	Dead	Dead Time for Synchronous Rectification, variable output voltage	DT = Dead time in seconds
DeadSync	Generic	Dead	Dead Time for Synchronous Rectification	DT = Dead time in seconds RS = GateUpper to SourceUpper resistance
DeadTime	Generic	Dead	Dead Time Signal Generator, Floating	DT = Dead time in seconds VHIGH = High voltage output in Volts VLOW = Low voltage output in Volts RS = GateUpper to SourceUpper resistance
NewDT	Generic	Dead	Dead Time Signal Generator similar to Deadtime but not floating	DT = Dead time in seconds VHIGH = High voltage output in Volts VLOW = Low voltage output in Volts RS = GateUpper to SourceUpper resistance
Sawtooth	Generic	Misc	Sawtooth Voltage	Initial = DC Voltage value in Volts Delay = Time Delay in Seconds Pulse = Pulsed Voltage value in Volts Duty = Duty cycle in percent Skew = Ratio of rise to fall edge times in percent Period = Signal period in Seconds
Spark_gap2	Generic	Misc	Highly nonlinear device whose function is to stop transient surges on DC or AC power supply lines.	V_GLOW = Glow discharge voltage VARC = Arc voltage ISUS = Minimum sustaining current V_BREAKDN = Break down voltage I_ARC = Minimum arc current
Ftube	Generic	Misc	Fluorescent Tube	VTHRES = Cold voltage at which the lamp strikes in Volts VARC = Voltage corresponding to the lamp arc voltage in Volts ISUS = Current under which the arc is stopped in Amps
WAVE820	Generic	Misc	8/20us Waveform	IP=Peak Current
WAVE101K	Generic	Misc	10/1000us Waveform	IP=Peak Current
WAVE1250	Generic	Misc	1.2/50us Waveform	VP=Peak Voltage
WAVEEFT	Generic	Misc	EFT Waveform	VP=Peak Voltage

CI230A	Generic	Misc	Ford CI 230 Waveform A	td=initial time delay
CI230B	Generic	Misc	Ford CI 230 Waveform B	
CI230C	Generic	Misc	Ford CI 230 WaveformC	
CI230D	Generic	Misc	Ford CI 230 Waveform D	
CI260A	Generic	Misc	Ford CI 260 Waveform A	Up=Steady state voltage T="T" pulse width parameter Delay=Delay Time tt=transition time (10us default)
CI260B	Generic	Misc	Ford CI 260 Waveform B	Up=Steady state voltage T=Dropout pulse width Delay=Delay Time tt=transition time (10us default)
CI260C	Generic	Misc	Ford CI 260 WaveformC	Up=Steady state voltage T=Dropout pulse width Delay=Delay Time tt=transition time (10us default)
CI260D	Generic	Misc	Ford CI 260 Waveform D	Up=Steady state voltage U1=Voltage dip value T=Dropout pulse width Delay=Delay Time tt=transition time (10us default)
CI260E	Generic	Misc	Ford CI 260 Waveform E	Delay=Additional delay time
CI250 Sequence 1	Generic	Misc	Ford CI 250 Sequence 1	Us=Peak Amplitude Freq=Frequency td=initial time delay
CI250 Sequence 2	Generic	Misc	Ford CI 250 Sequence 2	Us=Peak Amplitude Freq=Frequency td=initial time delay
CI250 Sequence 3	Generic	Misc	Ford CI 250 Sequence 3	Us=Peak Amplitude Freq=Frequency td=initial time delay
CI250 Sequence 4	Generic	Misc	Ford CI 250 Sequence 4	Us=Peak Amplitude Freq=Frequency td=initial time delay
CI220 E	Generic	Misc	Ford CI 220 Waveform E	t3=time delay between Up's initial fall to zero and the transient pulse td=initial time delay
CI220 G1	Generic	Misc	Ford CI 220 Waveform G1	tper=time between the rising edge of the load dump transients td=initial time delay
CI220 G2	Generic	Misc	Ford CI 220 Waveform G2	tper=time between the rising edge of the load dump transients td=initial time delay
CI220 F1	Generic	Misc	Ford CI 220 Waveform F1	ti=initila time delay t1=time between the rising edge of the transient waveform
CI220 F2	Generic	Misc	Ford CI 220 Waveform F2	Us=peak amplitude of the double exponential waveform. tr=10%-90% rise time of the double exponential pulse td=10%-10% pulse width of the double exponential pulse tdc=amount of time the DC voltage is at 13.5V before dropping to zero t2=amount of time between the DC voltage dropping to zero and rising to 13.5V again. t2 must be large enough so that the double exponential pulse can rise and fall completely. Ri=internal resistance. As per the Ford guideline this is 500mOhms or less.
CI 230A	Generic	Automotive_Sources	Ford FMC1278 CI 230A	AutomotiveSources.OPJ
CI 210	Generic	Automotive_Sources	Ford FMC1278 CI 210	AutomotiveSources.OPJ
CI 220 ISO Pulse 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 ISO Pulse 1	AutomotiveSources.OPJ
CI 221 ISO Pulse 1	Generic	Automotive_Sources	Ford FMC1278 CI 221 ISO Pulse 1	AutomotiveSources.OPJ
CI 221 Pulse 2A	Generic	Automotive_Sources	Ford FMC1278 CI 221 Pulse 2A	AutomotiveSources.OPJ
CI 221 Pulse 2B	Generic	Automotive_Sources	Ford FMC1278 CI 221 Pulse 2B	AutomotiveSources.OPJ
CI 221 Pulse 3A	Generic	Automotive_Sources	Ford FMC1278 CI 221 Pulse 3A	AutomotiveSources.OPJ
CI 221 Pulse 3B	Generic	Automotive_Sources	Ford FMC1278 CI 221 Pulse 3B	AutomotiveSources.OPJ
CI 222 Pulse 5A	Generic	Automotive_Sources	Ford FMC1278 CI 222 Pulse 5A	AutomotiveSources.OPJ
CI 222 Pulse 5B	Generic	Automotive_Sources	Ford FMC1278 CI 222 Pulse 5B	AutomotiveSources.OPJ
CI 231	Generic	Automotive_Sources	Ford FMC1278 CI 231	AutomotiveSources.OPJ
CI 250 Sequence 1	Generic	Automotive_Sources	Ford FMC1278 CI 250 Sequence 1	AutomotiveSources.OPJ
CI 250 Sequence 2	Generic	Automotive_Sources	Ford FMC1278 CI 250 Sequence 2	AutomotiveSources.OPJ
CI 250 Sequence 3	Generic	Automotive_Sources	Ford FMC1278 CI 250 Sequence 3	AutomotiveSources.OPJ
CI 250 Sequence 4	Generic	Automotive_Sources	Ford FMC1278 CI 250 Sequence 4	AutomotiveSources.OPJ
CI 280 ESD	Generic	Automotive_Sources	Ford FMC1278 CI 280 ESD	AutomotiveSources.OPJ
Mode 3 Generator	Generic	Automotive_Sources	Ford FMC1278 CI 220 Mode 3 Generator	AutomotiveSources.OPJ
CI 220 Pulse A1 Mode 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A1 Mode 1	AutomotiveSources.OPJ
CI 220 Pulse A1 Mode 2	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A1 Mode 2	AutomotiveSources.OPJ
CI 220 Pulse A2-1 Mode 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A2-1 Mode 1	AutomotiveSources.OPJ
CI 220 Pulse A2-1 Mode 3	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A2-1 Mode 3	AutomotiveSources.OPJ
CI 220 Pulse A2-2 Mode 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A2-2 Mode 1	AutomotiveSources.OPJ
CI 220 Pulse A2-2 Mode 3	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse A2-2 Mode 3	AutomotiveSources.OPJ
CI 220 Pulse C1 Mode 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse C1 Mode 1	AutomotiveSources.OPJ
CI 220 Pulse C1 Mode 3	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse C1 Mode 3	AutomotiveSources.OPJ
CI 220 Pulse C2 Mode 1	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse C2 Mode 1	AutomotiveSources.OPJ
CI 220 Pulse C2 Mode 3	Generic	Automotive_Sources	Ford FMC1278 CI 220 Pulse C2 Mode 3	AutomotiveSources.OPJ

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