Using Schematic Part Libraries and PCB Footprint Libraries for Stellaris® Microcontrollers

Application Note

TEXAS INSTRUMENTS

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CAD library provided by PCB Matrix Corp. Library documentation with LP Viewer for these and thousands of other parts are available at www.PCBmatrix.com.

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Introduction

Component libraries are provided to accelerate hardware development using Stellaris® microcontrollers. Schematic part libraries eliminate the time-consuming process of entering part and pin information (see "Using the Schematic Part Libraries for Stellaris® Microcontrollers" on page 4). PCB footprint libraries also save time and reduce risk by providing optimal geometry for most PCB processes (see "Using the PCB Footprint Libraries for Stellaris® Microcontrollers" on page 7). This application note describes the use and formatting of both types of libraries.

Note: The exact terminology used to reference the part libraries varies between tools. This document uses the following general definitions:

A *part library* is a file that encapsulates information on a component. The information is referenced by part number and usually has a dedicated schematic symbol. Footprint, 3-D model, and other information may be included, but is more commonly implemented by a reference to an external library containing those items.

A *footprint* is the physical instance of a component as used by the PCB layout tool. Sometimes called a decal. Footprints are sometimes integrated with part libraries but are more often contained in a separate generic footprint library.

An *attribute* is the assignment of the part libraries for the named attributes to each part in the library. Examples include the orderable part number, description, and PCB footprint.

Using the Schematic Part Libraries for Stellaris® Microcontrollers

The Stellaris part libraries contain schematic symbols for the entire range of Stellaris® microcontrollers including package variations. The libraries accelerate the design process by eliminating the tedious task of manually creating parts.

Figure 1. An Example Schematic Part
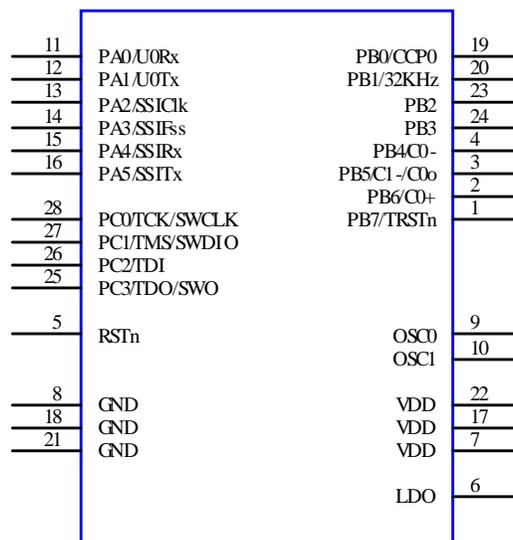
Note: Although Texas Instruments makes every effort to keep these libraries up to date, the information contained in part libraries should always be verified using the most recent data sheet.

Supported Formats

Part libraries are provided for Altium Designer, Cadence OrCAD, and PADS Logic. Table 1 shows the supported file format information.

Table 1.   Support File Format Information

Tool	Vendor	Version Used	File Format
Altium Designer	Altium	7.0.0 (Summer '08)	Advanced Schematic Binary Library (*.schlib)
OrCAD Capture	Cadence	7.2	OrCAD Schematic Library (*.olb)
PADS Logic	Mentor Graphics	2007.3	ASCII 07 library format

See your schematic tool documentation for version-compatibility questions. Texas Instruments is not able to support older versions or file formats for these tools.

Parameters

The part libraries provide a minimal parameter set for each component. This was done for portability across tools and also because most users have unique preferences for parameter definition and use. The following parameters are defined:

MFG   The manufacturer's name.

Ordering   The Stellaris part number less speed grade and revision information.

Description   Brief part description.

Footprint/PCB Decal   A reference to the PCB footprint.

LMI Class   Stellaris internal classification for this part.

Designator   The alpha prefix used when numbering parts on a schematic.

Comment   This parameter is left empty for user comments.

Note: Not all parameters are applicable to each library.

Altium Designer

The Altium directory contains both a schematic part library file and a PCB footprint library. To use the library, copy the contents of the directory into the Altium library directory (usually `C:\Program Files\Altium Designer\Library`) or another convenient location. The Altium library can be opened directly or added to the list of installed libraries.

OrCAD

The OrCAD directory contains only the schematic part library file. PCB CAD libraries for OrCAD layout and many other formats can be downloaded separately from the web site. The OrCAD library can be opened directly or added to the list of installed libraries.

The pin names used in each part are automatically generated from Stellaris data sheets. Since OrCAD requires that each pin have a unique name, errors may be flagged for multiple instances of VDD and other power pins. OrCAD will offer to automatically correct these the first time the library is accessed.

PADS Logic, PADS PCB

The PADS directory contains the following libraries:

- CAE library which contains the logic symbol
- Part library which adds complete part information and pin assignments
- Decal library which contains the PCB footprints for all Stellaris® microcontrollers

To use the library, copy the contents of the directory into the PADS library directory (usually `C:\MentorGraphics\PADS\SDD_HOME\Libraries`) or another convenient location. Then use the Library Manager's Manage Lib List button to add the library to the list of installed libraries.

The PADS libraries consist of three files:

- Schematic decal (luminary micro.ld07)
- Part type (luminary micro.pt07)
- PCB decal (luminary micro.pd07)

Like OrCAD, the pin names used in each part are automatically generated from Stellaris data sheets. Since PADS Logic requires that each pin have a unique name, warnings may be flagged for multiple instances of VDD and other power pins. Warnings can be ignored or manually corrected by adding a numeric suffix to the pins in question.

Using the Libraries with Other EDA tools

Due to the large number of schematic and PCB tools on the market, it is impractical to provide schematic part libraries in every format for all Stellaris® microcontrollers. A few of the most popular formats are provided. Fortunately, most tools have an import capability that can convert libraries from these formats. Although some tools do an excellent job of translating files, it is possible that some artifacts, typically text formatting, may exist.

Using the PCB Footprint Libraries for Stellaris® Microcontrollers

An optimal PCB layout is critical to the design of every electronic product. However, even before a PCB tape-out begins, it is important to start with high-quality PCB footprints for all components. To support PCB designers in this regard, PCB footprint libraries for all Stellaris® microcontrollers are provided. These libraries were created by PCB Matrix Corporation to IPC-7351A standards and are available for download from the www.luminarymicro.com web site. The footprint libraries are available in all major CAD formats as well as a PLB part library.

About the CAD Libraries

The PCB footprint libraries contain component footprints. Depending on the CAD tool, the component footprints may also be referred to as decals or land patterns.

Footprints

The PCB footprint libraries include footprints for all Stellaris® microcontroller package types, including:

- 28-pin SOIC

- 48-, 64-, and 100-pin LQFP

- 108-pin BGA

Supported Tools

Individual ZIP files containing the libraries have been provided for each CAD tool listed below:

- Allegro
- Altium Designer
- Board Station
- CADSTAR
- Eagle
- Expedition
- McCAD

- NI Ultiboard
- OrCAD Layout
- OrCAD PCB Editor
- PADS Layout
- Pantheon
- P-CAD
- Zuken CR5000

For some tools (for example, Altium Designer), the ZIP file contains a complete library file. To use the library, simply open the ZIP file and copy the library file into your CAD tool's existing library directory. It is usually necessary to add the Stellaris library to the library list.

For other tools (for example, PADS Layout), the library is saved in an ASCII or similar format. Open the ZIP file, then either import or open the file as a normal PCB layout. A collection of parts appears on the screen. It is then necessary to save the parts to an existing or new library. Most tools provide a single-step command for this operation.

The libraries are footprints only. Depending on the library structure, there may also be a part/ component with the same name as the footprint. Most users will want to link the footprints to schematic symbols or real part numbers using the CAD tool library management capabilities.
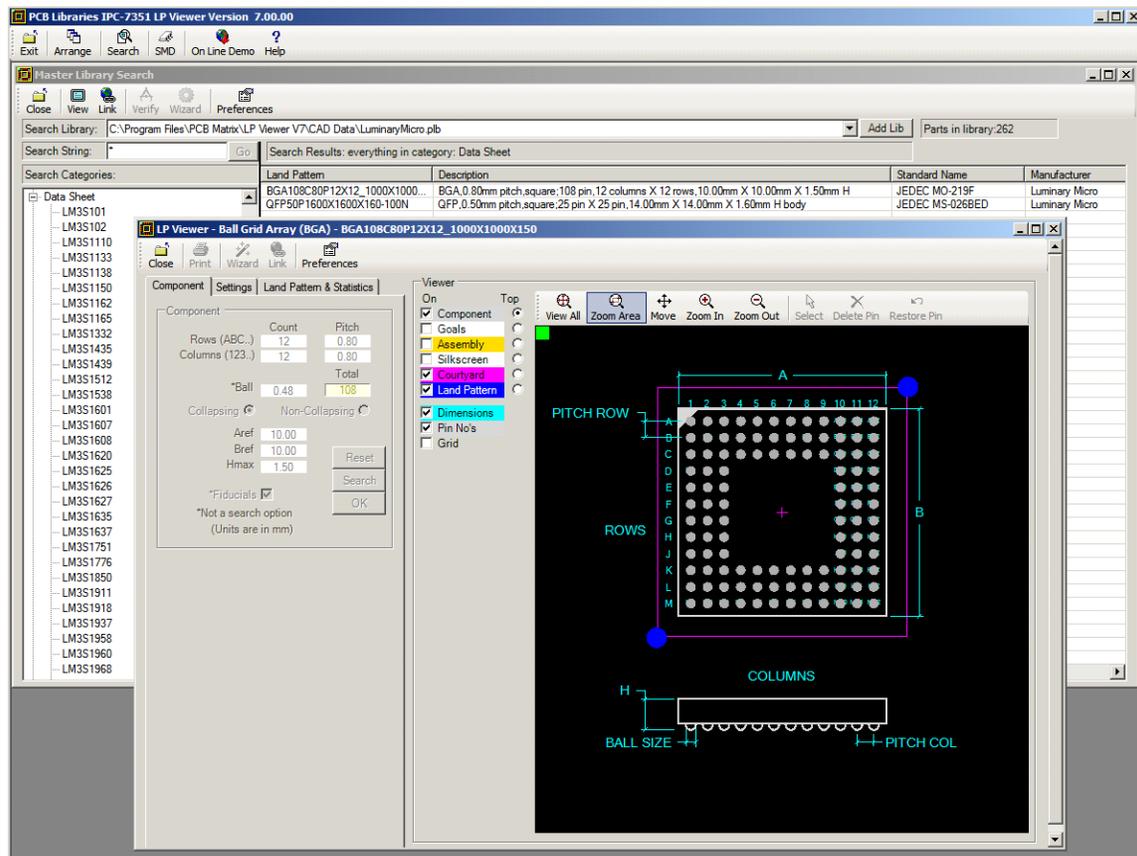
PCB Matrix Corp generated these libraries using their IPC-7351 LP Calculator tool. The footprints are created with median (nominal) land protrusion for a balance between density and solderability (Density Level B). Least, most, and other geometries can be created with the LP Calculator tool available directly from PCB Matrix Corporation.

About the PLB Part Library

PCB designers can also download the LuminaryMicro.plb part library file. A PLB file (.plb) provides the raw dimensional data necessary for CAD software to display components and land patterns in a graphical form. The PLB files also contain part attributes. Attributes hold vital statistical and descriptive data that every land pattern needs so other users can quickly identify the component characteristics. Attributes help organize data used to search for existing library parts.

The PLB files can be viewed with a Shareware viewer available for download from www.landpatterns.ipc.org. Figure 2 shows a screenshot of the LP Viewer displaying a Stellaris® LM3S6965 microcontroller in a BGA package.

Figure 2. LP Viewer Displaying a Stellaris® Microcontroller

The PLB file can also be used with the LP Calculator tool from PCB Matrix Corporation. The LP Calculator quickly generates additional footprint libraries using the PLB file dimensional data. Check the PCB Matrix Corporation web site at www.pcbmatrix.com for more information on the LP Calculator.

Conclusion

Texas Instruments provides schematic part library and PCB footprint library support for Stellaris® microcontrollers to PCB designers to ensure optimal layout. The PCB footprint libraries support optimal board design by providing both ready-to-use libraries for leading CAD tools and a viewable PLB file that can generate additional footprint variants.

References

The following documents and library files are available for download at www.luminarymicro.com:

■ PCB footprint library files for Stellaris® microcontrollers

■ PLB file for Stellaris® microcontrollers

■ Data sheets for Stellaris® microcontrollers

The following tools and information are available for download at www.PCBmatrix.com:

■ LP Calculator tool

■ LP Viewer and Library support

■ General library support questions

■ IPC-7351 LP Viewer download: http://landpatterns.ipc.org

■ PCB standards information

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