Getting Started with MPLAB® Mindi™ Analog Simulator Tool

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Table of Contents

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics, to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MPLAB® Mindi™ Analog Simulator Tool. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the MPLAB® Mindi™ Analog Simulator Tool as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- Introduction
- Running MPLAB® Mindi™ Simulator
- Welcome Page Overview and Navigation
- Creating a New Schematic
- Running the Simulation
- Simulation Results

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use the MPLAB® Mindi™ Analog Simulator Tool. Other useful documents are listed below.

- None available at this time.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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Users of Microchip products can receive assistance through several channels:

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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (January 2017)

- Initial Release of this Document.

NOTES:

Getting Started with MPLAB® Mindi™ Analog Simulator Tool

1.1 INTRODUCTION

The MPLAB® Mindi™ Analog Simulator Tool is a comprehensive tool for circuit analysis. It consists of:

- SIMPLIS (SIMulation of Piecewise LInear Systems): A circuit simulator specifically designed to handle the simulation challenges of switching power systems. Similar to SPICE, SIMPLIS works at the component level, but typically can perform a transient analysis of a switching circuit 10 to 50 times faster. For switching power systems, the Piecewise Linear (PWL) modeling and simulation techniques employed by SIMPLIS result in qualitatively superior convergence behavior as compared to SPICE.
- SIMetrix: A general analog and mixed-signal simulator that includes an enhanced SPICE simulator, schematic editor and waveform viewer in a unified environment. It is easy to use, offers good accuracy and performance, and rapid convergence for a broad range of analog and mixed-signal design applications.

1.2 RUNNING MPLAB® MINDI™ SIMULATOR

To start the MPLAB Mindi Simulator, double-click on the desktop shortcut after installation or select *Start>All Programs>Mindi 8.00*. A splash screen will display the MPLAB Mindi Simulator logo followed by the MPLAB Mindi Simulator desktop.

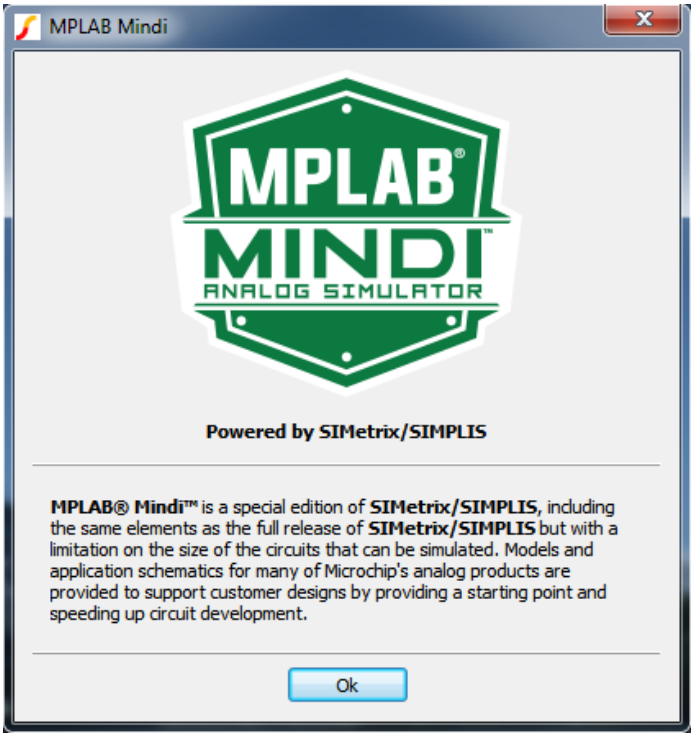

FIGURE 1-1: *MPLAB® Mindi™ Simulator Splash Screen.*

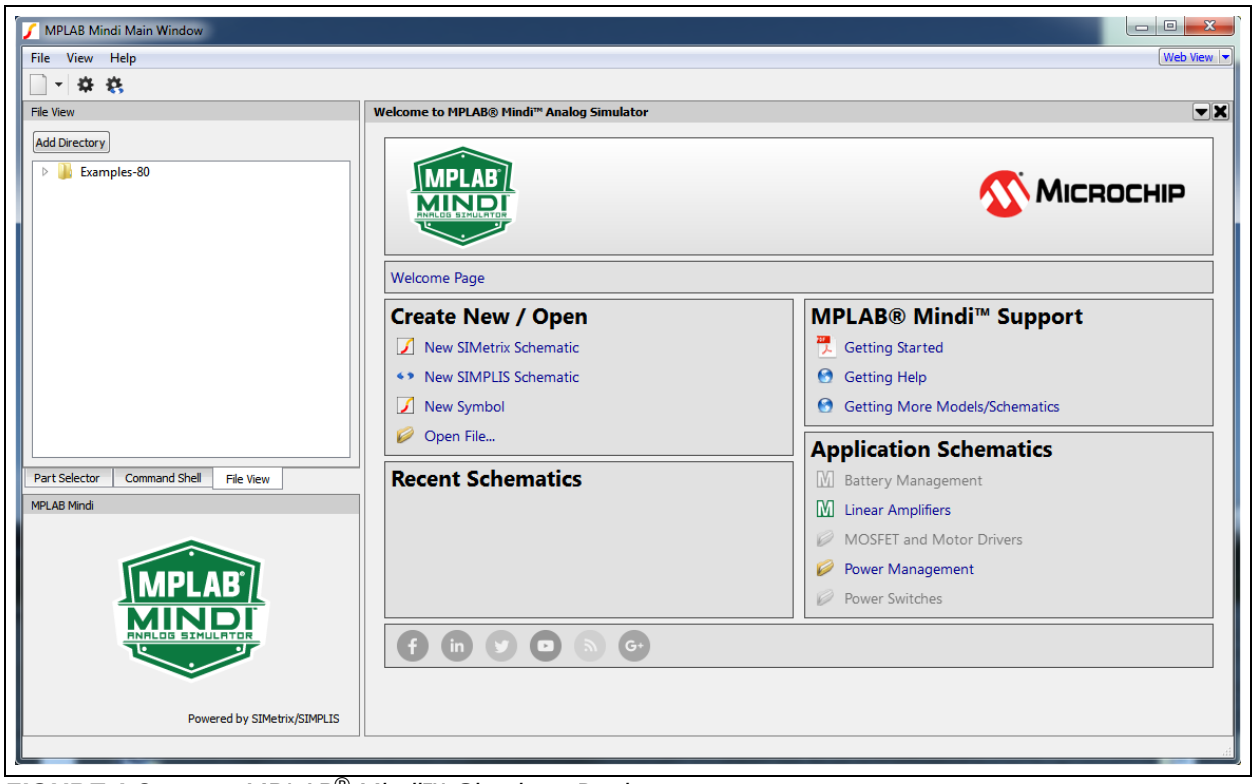

FIGURE 1-2: *MPLAB® Mindi™ Simulator Desktop.*

NOTICE

It is strongly recommended that the user lets MPLAB® Mindi™ periodically check for updates to ensure that the simulator always has the latest models and example schematics.
The user can do this by clicking on *Help>Check for updates…* and set the Automatic Update Schedule to Monthly.

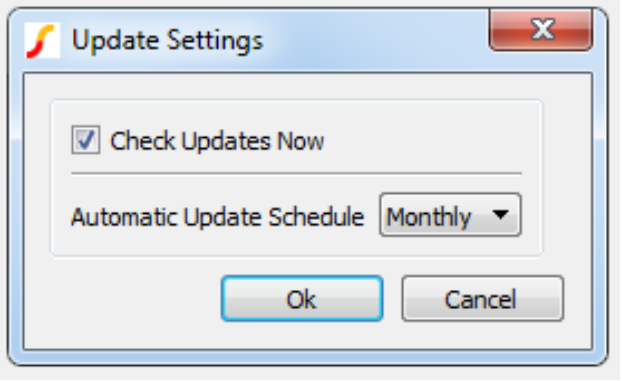

FIGURE 1-3: *MPLAB® Mindi™ Update Settings Window.*

1.3 WELCOME PAGE OVERVIEW AND NAVIGATION

After the MPLAB Mindi Simulator start-up, the Welcome Page will be shown. It has quick links for the following actions:

- Create New/Open: Open or create a new schematic for SIMPLIS or SIMetrix from scratch.
- Application Schematics: Browse existing application schematics by category.
- Recent Schematics: Open recent schematics.
- MPLAB® Mindi™ Support: Get help or more application schematics from Microchip Technology Inc.

The existing directory structure, containing application schematics, can also be visualized in the left frame by clicking on the **File View** tab.

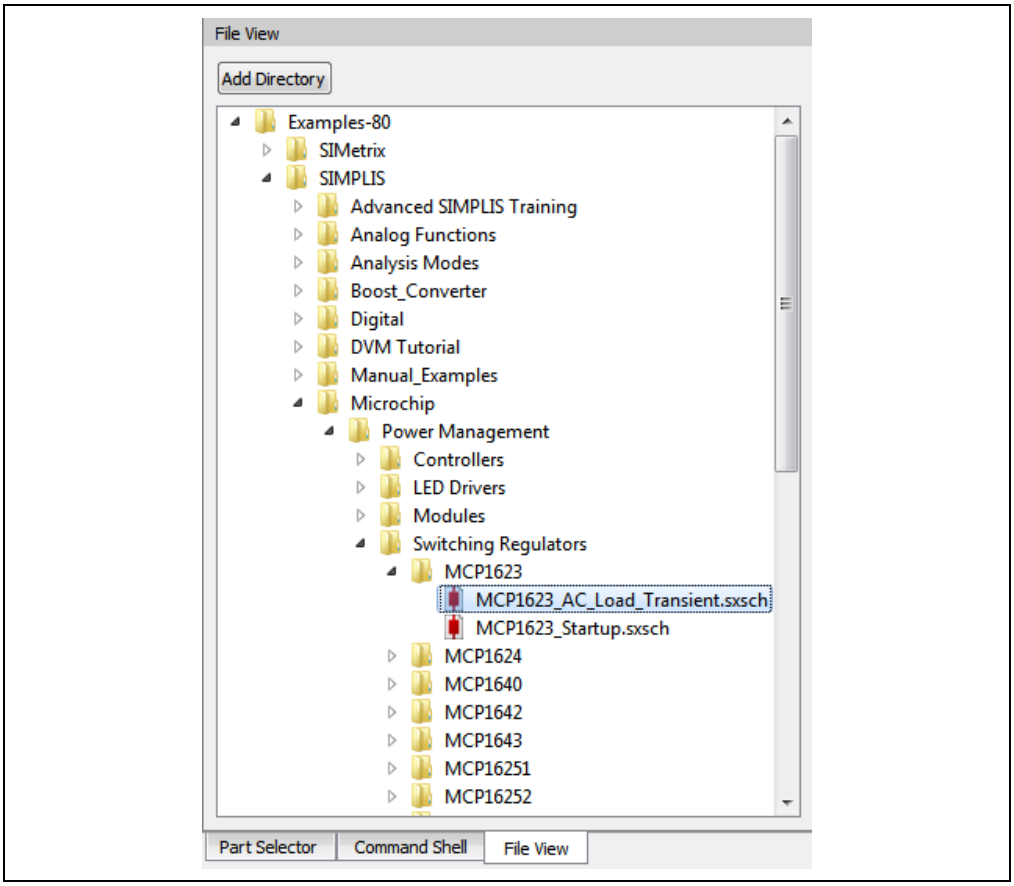

FIGURE 1-4: *Directory Structure in the **File View** Tab.*

The user can also easily navigate through this directory structure using the Welcome Page breadcrumbs by clicking on one directory in the Application Schematics frame.

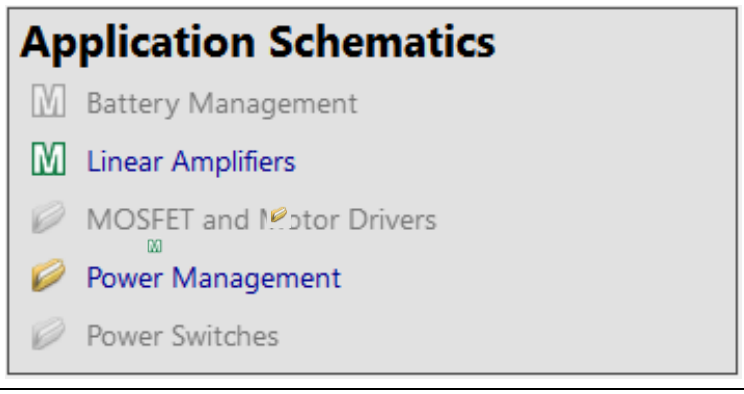

FIGURE 1-5: *The Application Schematics Frame.*

During navigation, the breadcrumb area will indicate the current path in the directory hierarchy.

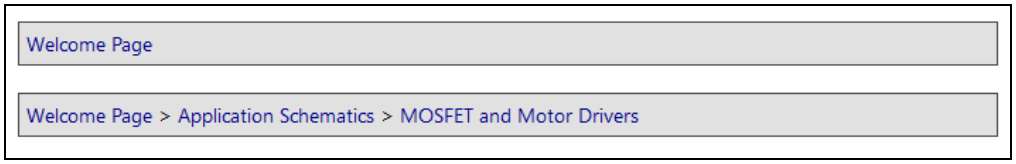

FIGURE 1-6: *Breadcrumb Area View Showing the Current Path.*

Note: The directory-type icon means that the user can go down in the hierarchy. The Mindi icon represents folders that are at the bottom level. In those folders, you can find the application schematic that you want. The faded icons mean empty directories.

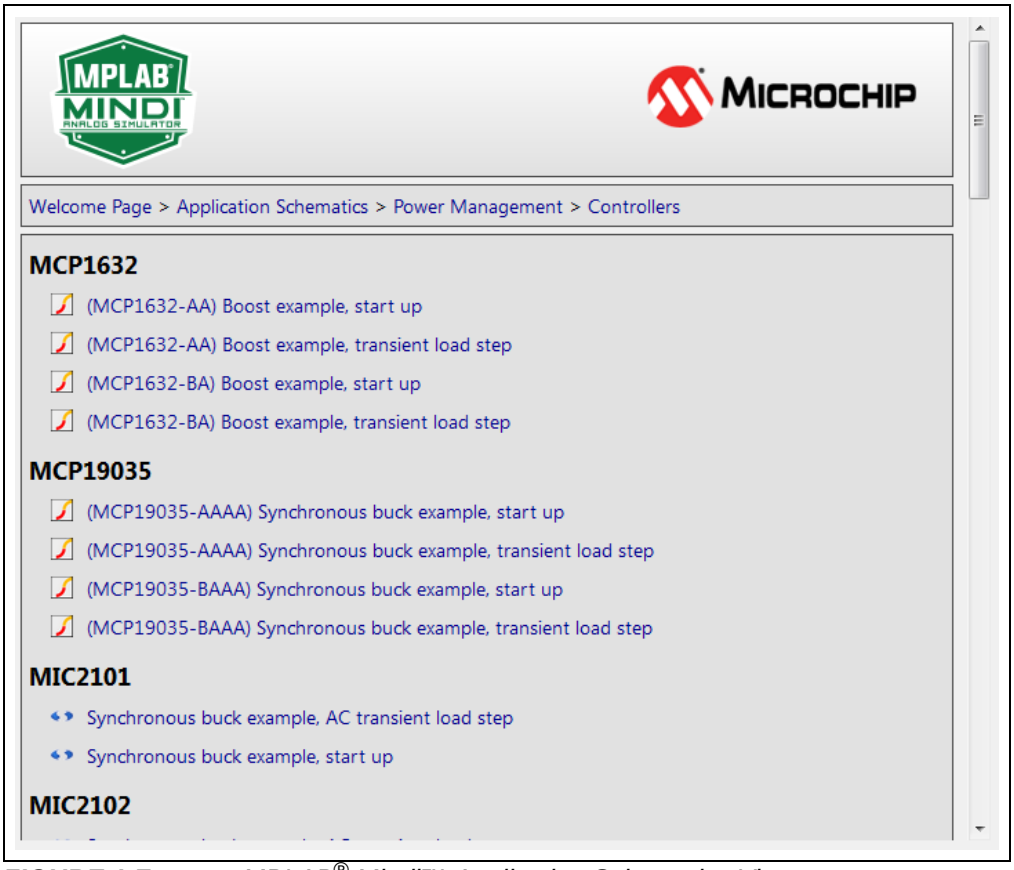

FIGURE 1-7: *MPLAB® Mindi™ Application Schematics View.*

The schematic files have two types of icons. SIMetrix files are marked with the icon and SIMPLIS schematics are marked with the icon.

NOTICE

It is highly recommended that if the example schematics require modifications, the user should save the modified schematics in a different location by using *File>Save Schematic As...* to avoid any potential conflicts.

1.4 CREATING A NEW SCHEMATIC

The user can create a new schematic from *File>New>SIMetrix/SIMPLIS Schematic* or by using the *Create New/Open* quick link from the Welcome Page.

By pressing the <Ctrl + G> key combination, the user can see all the models that are installed.

Microchip Technology Inc. models are available from *Place>From Microchip Library*. Here, the user will find only the models that are compatible with the schematic type (SIMetrix or SIMPLIS).

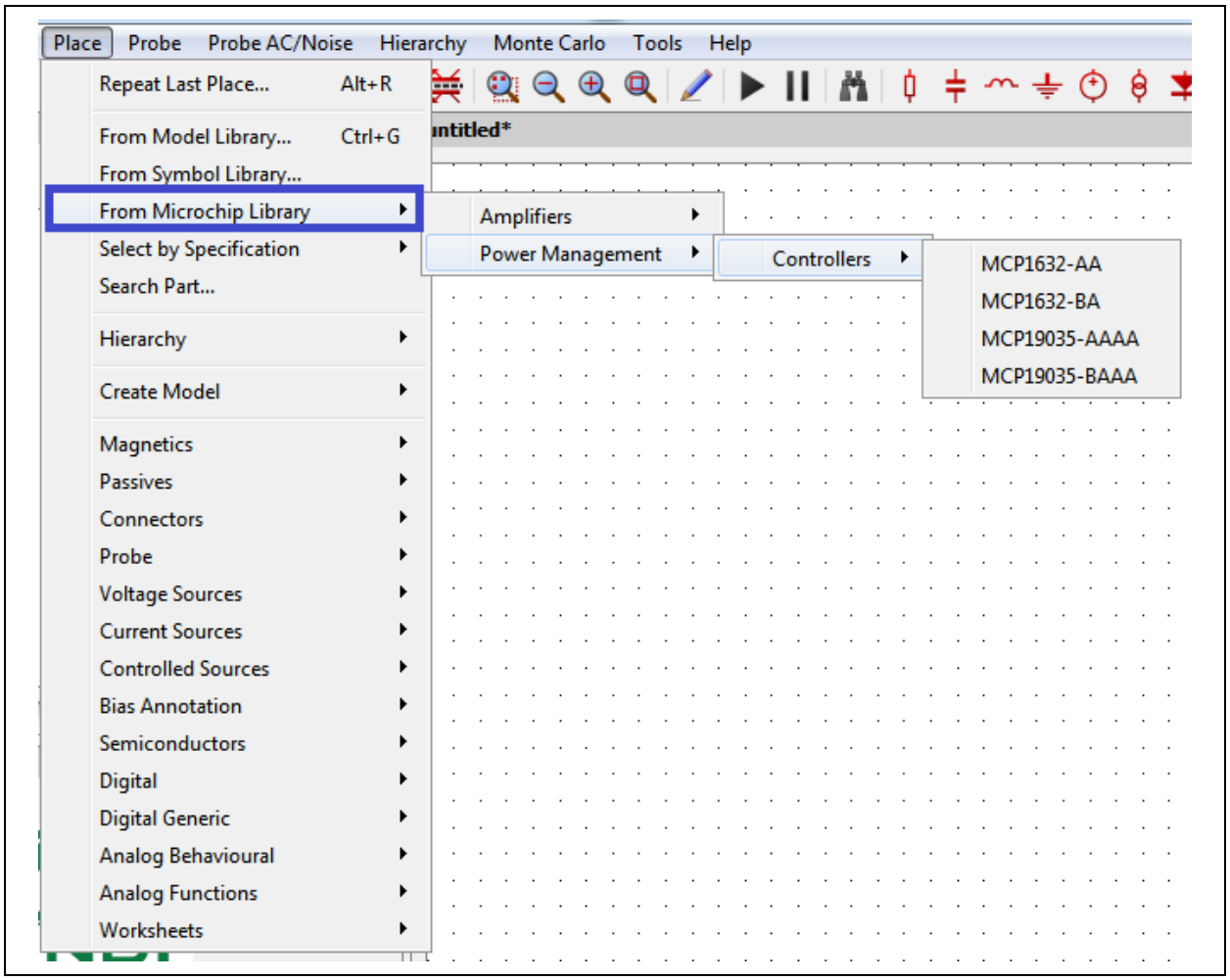

FIGURE 1-8: *View of Installed Models.*

1.5 RUNNING THE SIMULATION

After opening a Microchip application schematic, the user can run the default analysis by pressing the <F9> key or by clicking on *Simulator>Run Schematic*.

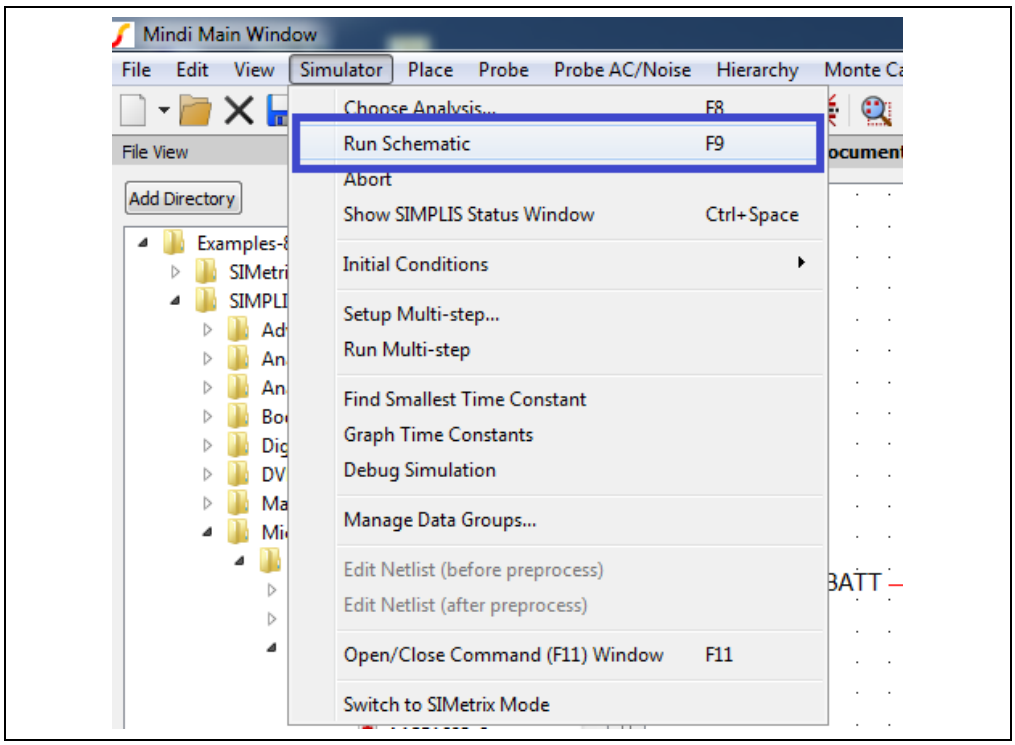

FIGURE 1-9: *Running the Default Analysis on a Microchip Schematic.*

The default analysis type is highlighted in the application schematic's file name (e.g., `MCP1623_AC_Load_Transient`) and its parameters can be altered after opening the Choose Analysis window, which is available by pressing the <F8> key or by clicking on *Simulator>Choose Analysis*. If the user wants to run a user-created schematic, the analysis type and its parameters must be chosen first.

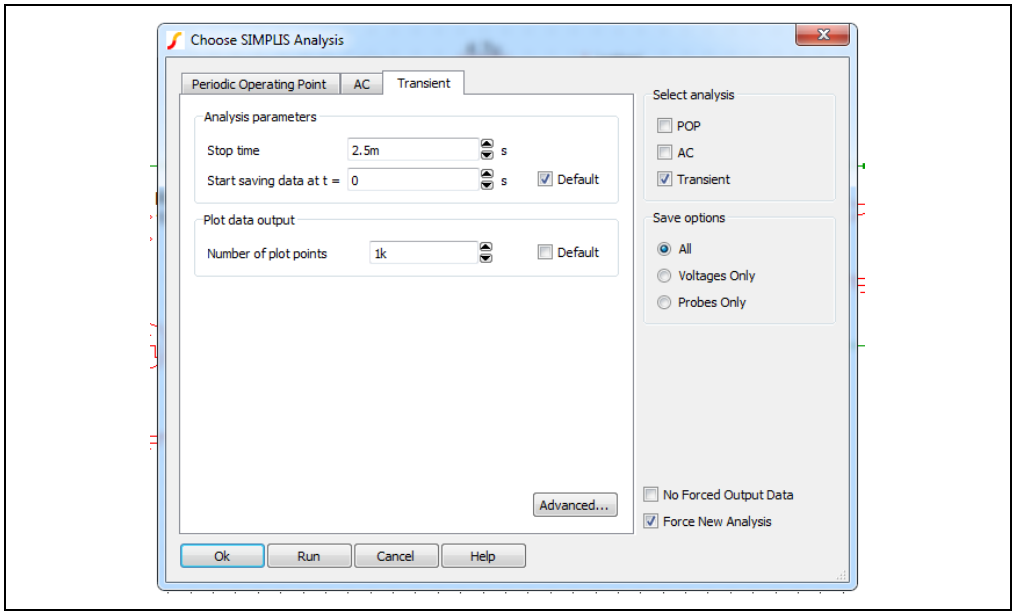

FIGURE 1-10: *The Choose Analysis Window.*

The analysis options for SIMPLIS and SIMetrix are different and the models are not compatible from one tool to another. If the user wants to run a SIMPLIS schematic using the SIMetrix tool (or vice versa), the MPLAB Mindi Simulator will issue a warning and will highlight the non-compatible parts.

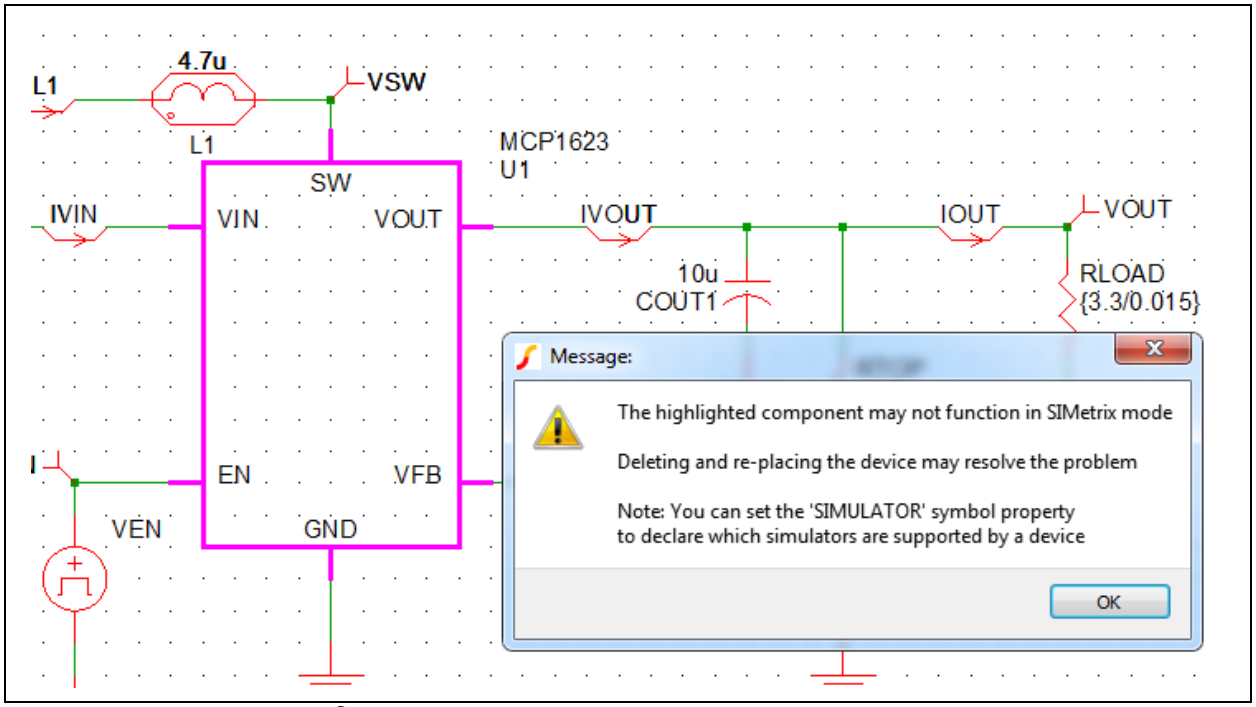

FIGURE 1-11: *MPLAB® Mindi™ Simulator Warning Message with Highlighted Non-Compatible Parts.*

1.6 SIMULATION RESULTS

The user can check the state of the analysis in the Simulation Status window.

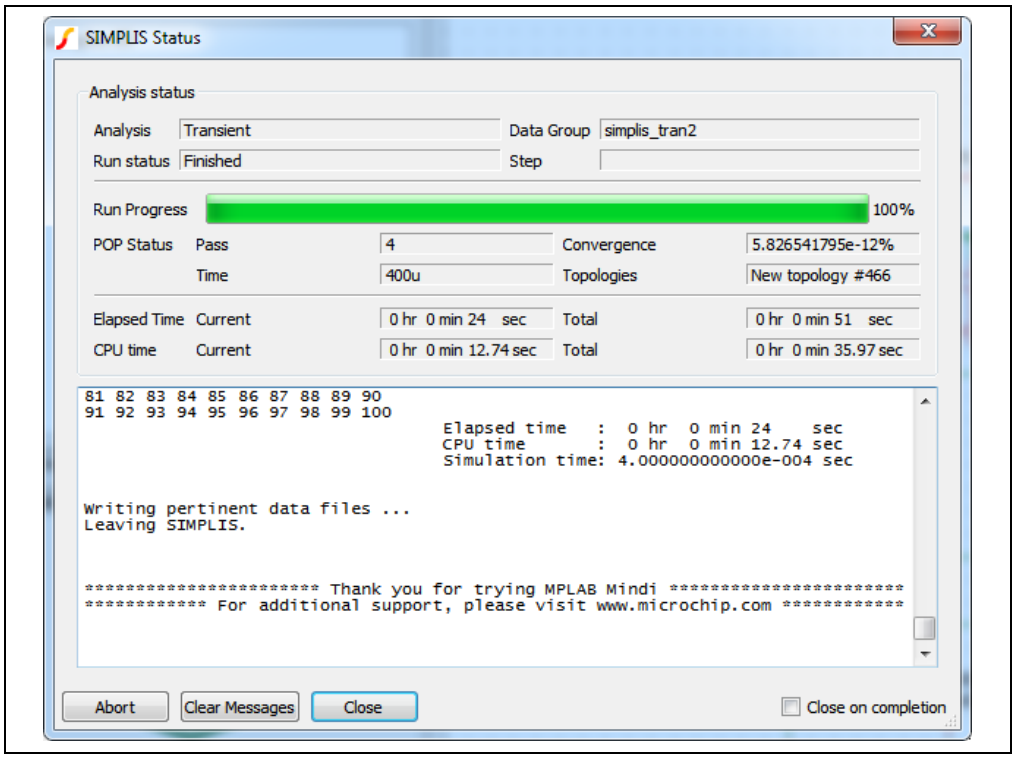

FIGURE 1-12: *Simulation Status Window.*

After the simulation is finished, the results will pop up.

Note:	The schematic must have signal probes that are consistent with the analysis type.

The MPLAB Mindi Simulator can do time domain (waveforms) and frequency domain (Bode plots) analysis.

A time domain simulation shows characteristics, such as response time and overshoot.

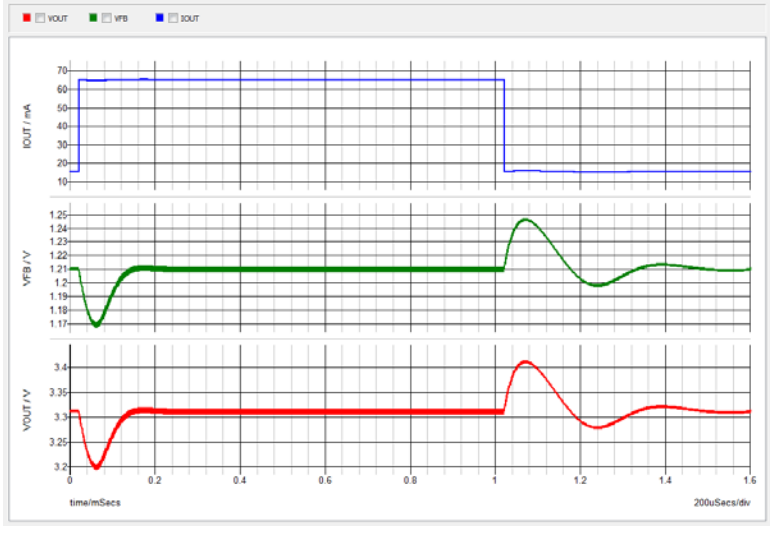

FIGURE 1-13: *Time Domain Simulation.*

While time domain analysis shows how a signal changes over time, frequency domain analysis shows how the signal's energy is distributed over a range of frequencies.

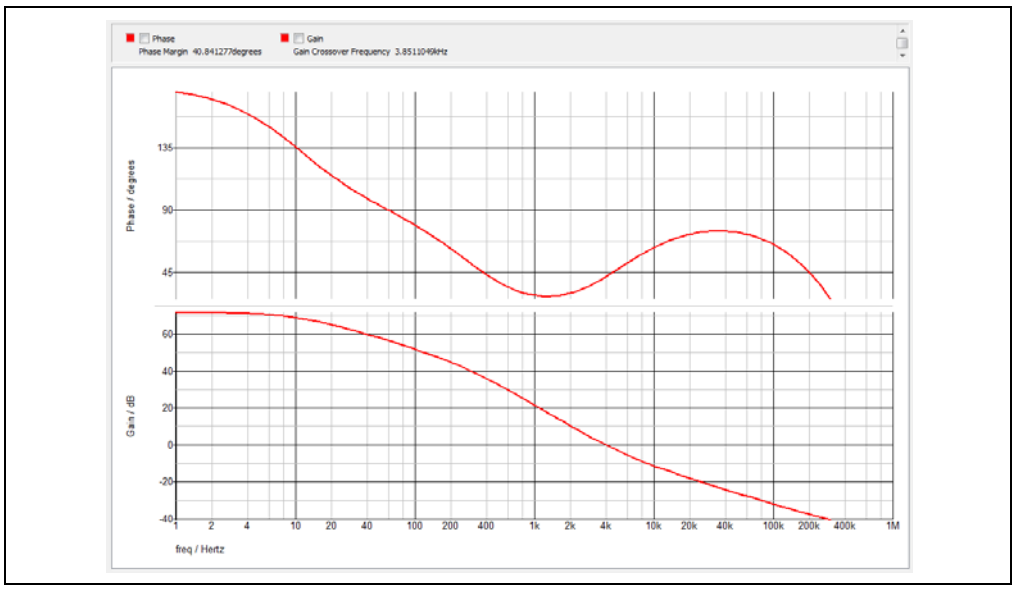

FIGURE 1-14: *Frequency Domain Simulation*

This frequency domain analysis produces the Bode plots. These plots include critical information regarding the circuit's closed-loop stability, such as gain and phase margins.

NOTES:

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