



**Getting Started with
MPLAB® MINDI™
Analog Simulator Tool**

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GETTING STARTED WITH MPLAB® MINDI™ ANALOG SIMULATOR TOOL

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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 Getting started with MPLAB® MINDI™ Analog Simulator Tool. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [Warranty Registration](#)
- [Recommended Reading](#)
- [The Microchip Web Site](#)
- [Customer Support](#)
- [Document Revision History](#)

DOCUMENT LAYOUT

This document describes how to use the Getting started with 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	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> 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	<u><i>File>Save</i></u>
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [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) { ... }

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

RECOMMENDED READING

This user's guide describes how to use the Getting started with MPLAB® MINDI™ Analog Simulator Tool. Other useful documents are listed below. The following Microchip document is available and recommended as a supplemental reference resource:

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:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **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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CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- 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 (December 2016)

- Initial Release of this Document.

NOTES:

Getting started with MPLAB® MINDI™ Analog Simulator Tool

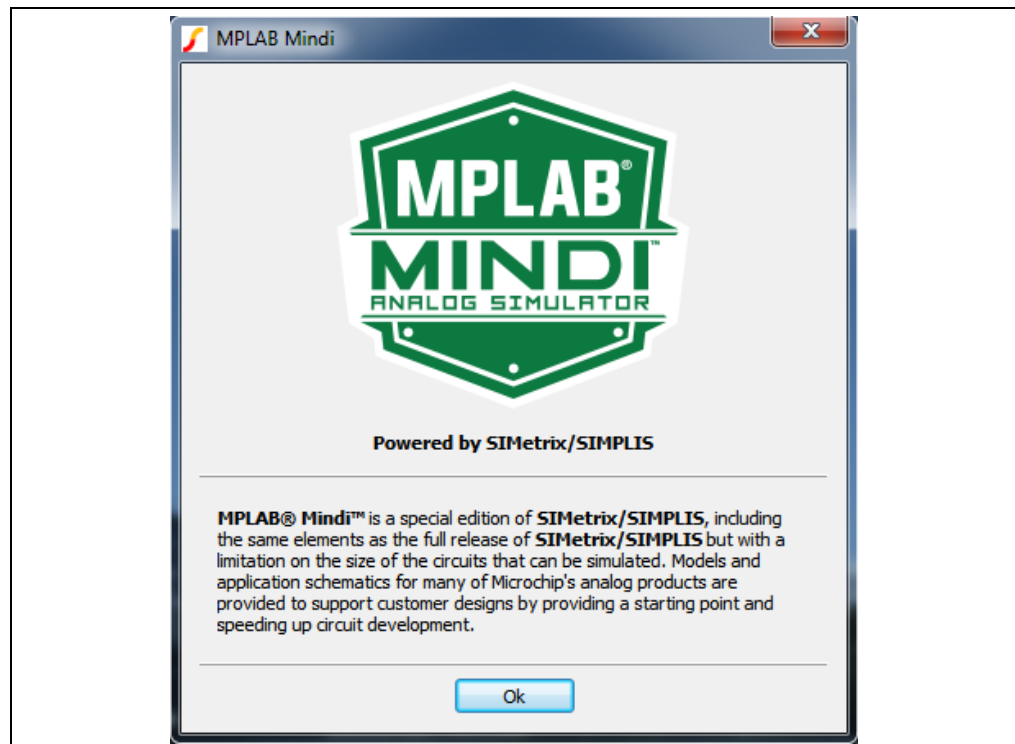
1.1 INTRODUCTION

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

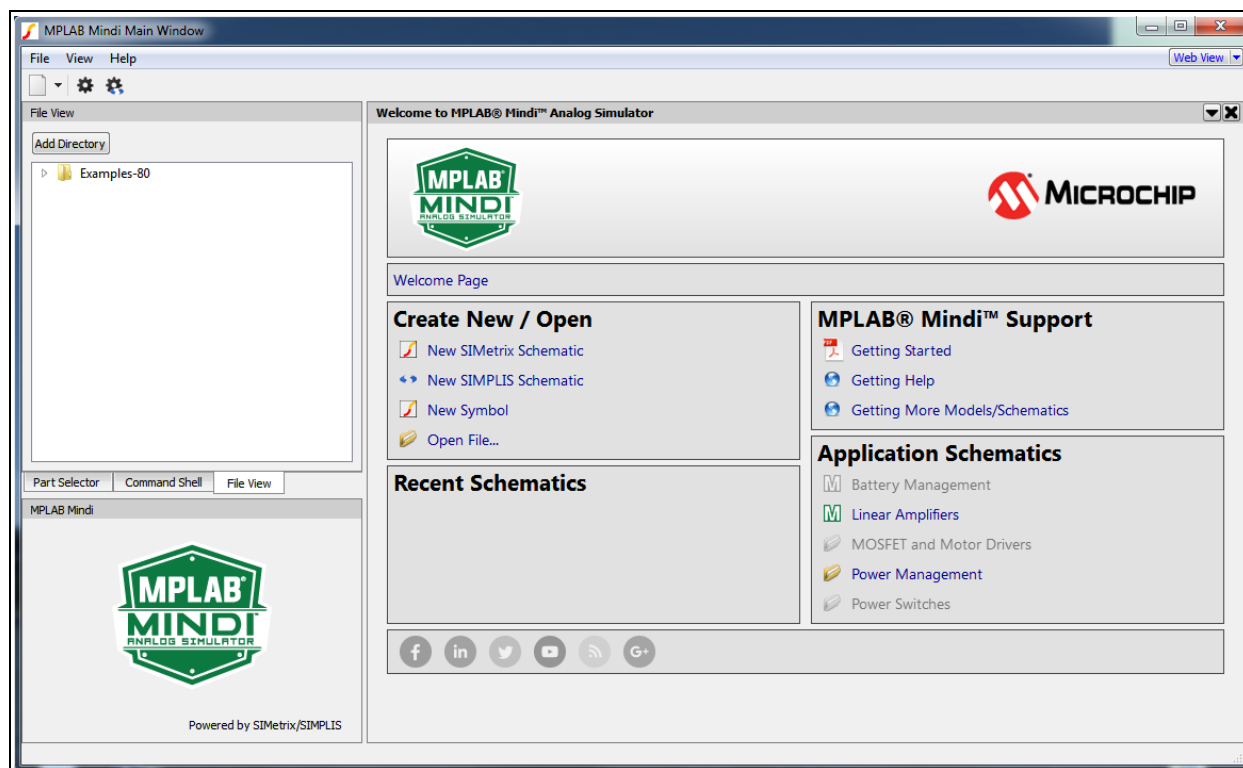
- SIMPLIS (SIMulation of Piecewise LInear Systems): is a circuit simulator specifically designed to handle the simulation challenges of switching power systems. Like SPICE, SIMPLIS works at the component level but typically can perform a transient analysis of a switching circuit 10 to 50 times faster. For switching power systems, the piecewise linear (PWL) modeling and simulation techniques employed by SIMPLIS result in qualitatively superior convergence behavior compared to SPICE.
- SIMetrix: is a general analog and mixed-signal simulator. It 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 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.



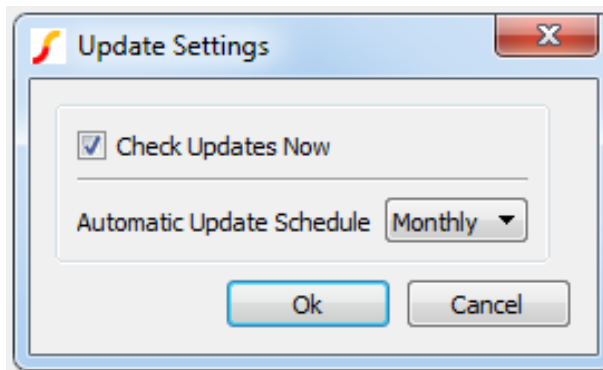
Getting started with MPLAB® MINDI™ Analog Simulator Tool



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.

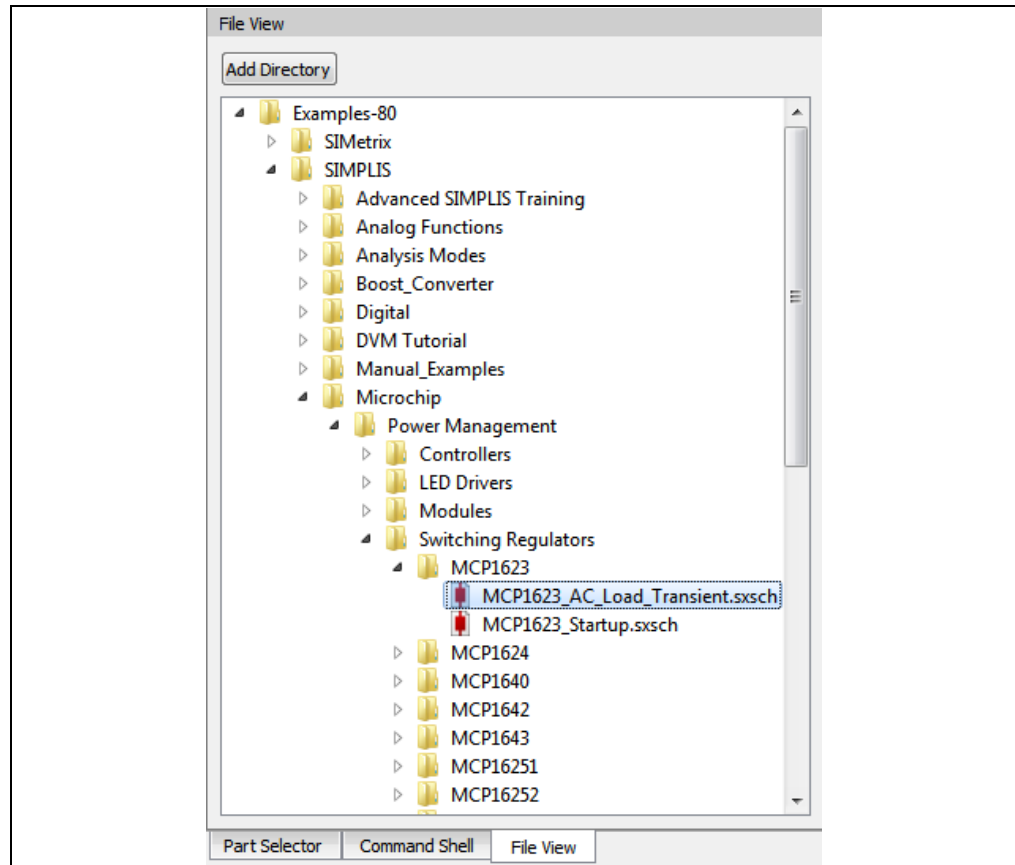


1.3 WELCOME PAGE OVERVIEW AND NAVIGATION

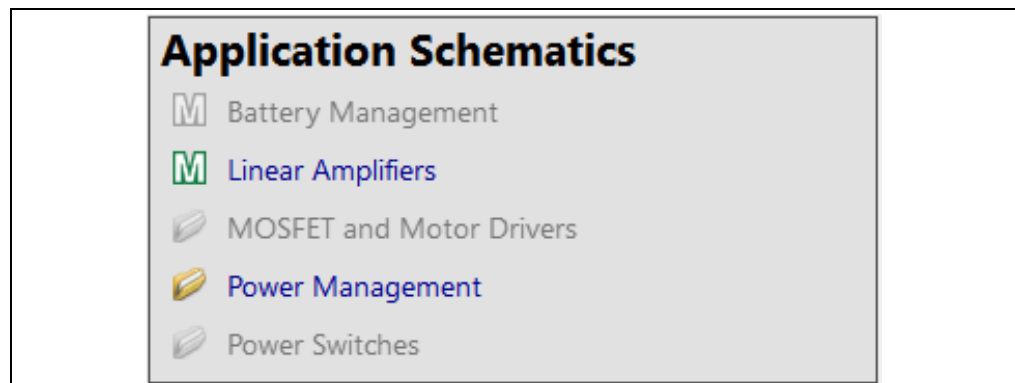
After MPLAB® MINDI™ Simulator startup, the Welcome Page will be shown. It has quick links for the following actions:

- 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.



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.



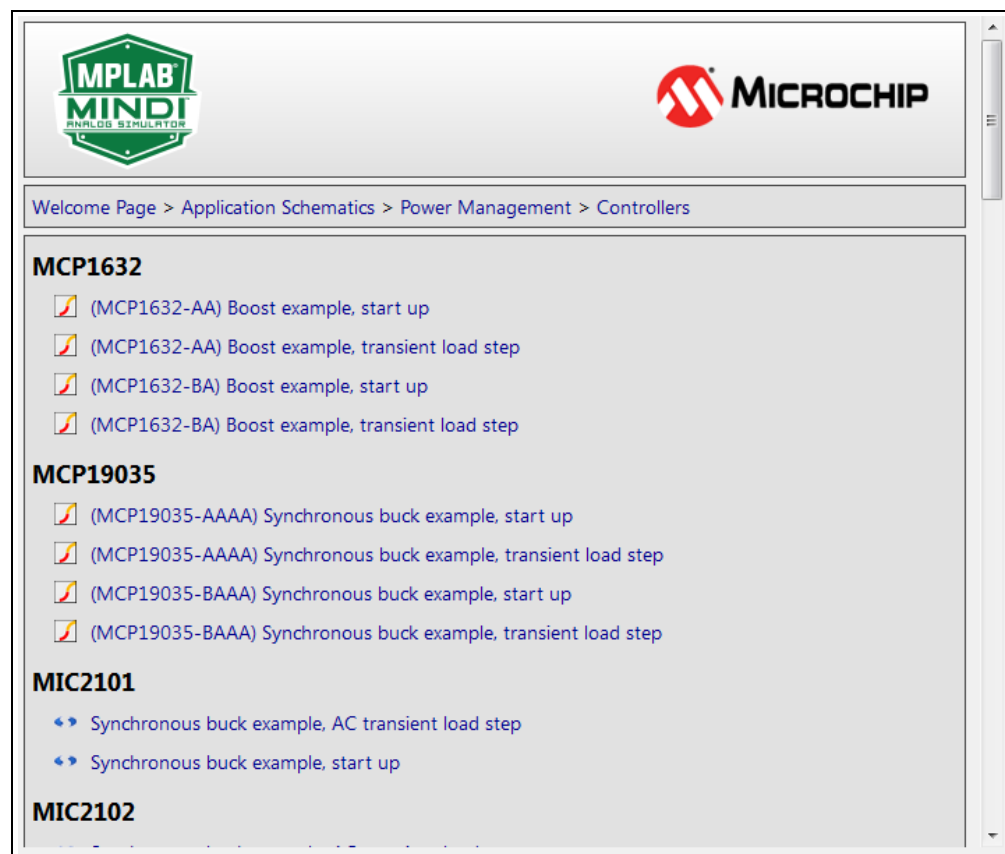
Getting started with MPLAB® MINDI™ Analog Simulator Tool

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

[Welcome Page](#)

[Welcome Page](#) > [Application Schematics](#) > [MOSFET and Motor Drivers](#)

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 you can find the application schematic that you want. The faded icons means empty directory.



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

NOTICE

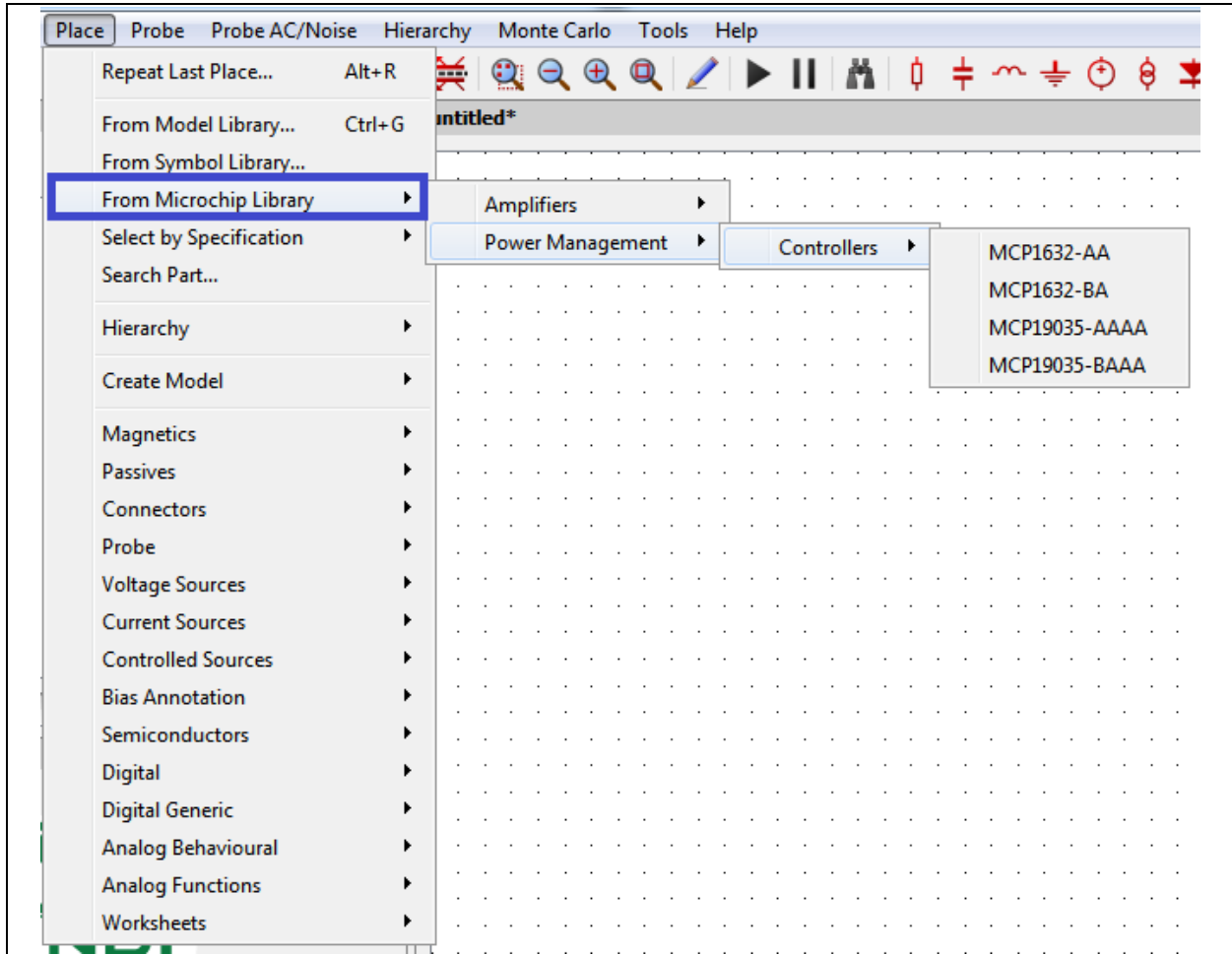
It is highly recommended that if the example schematics require modifications, the user should save the modified schematics in a different location by using **File>Save Schematic As...** to avoid any potential conflicts.

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.

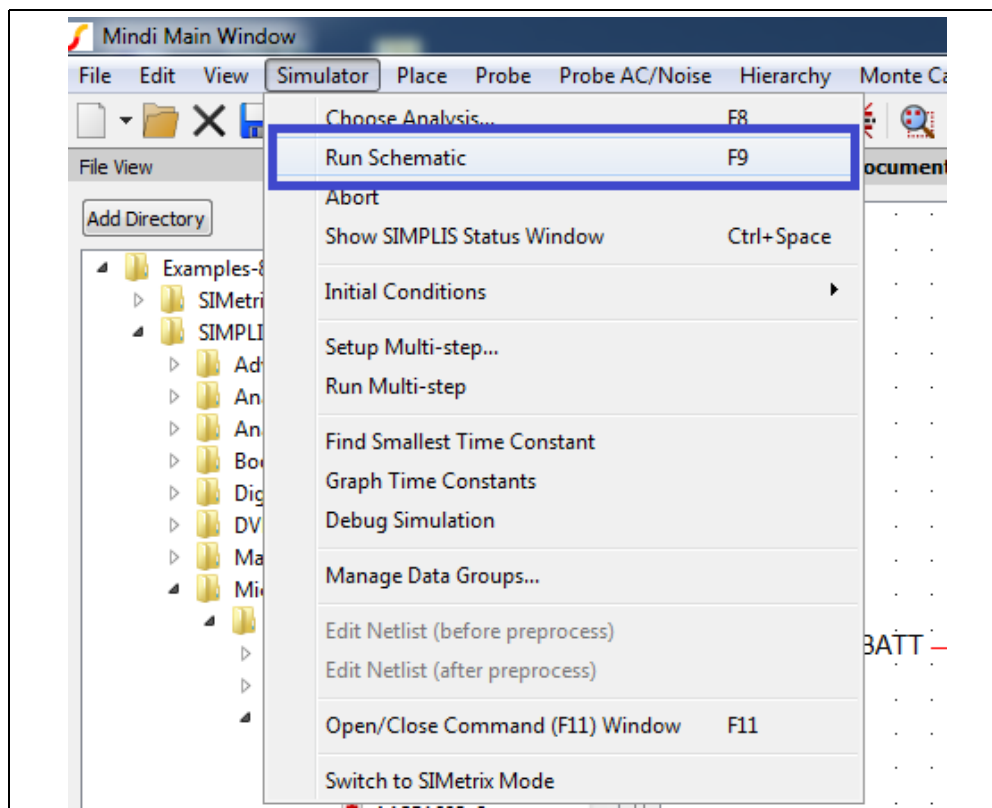
By pressing the *Ctrl + G* key combination the user can see all models installed.

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

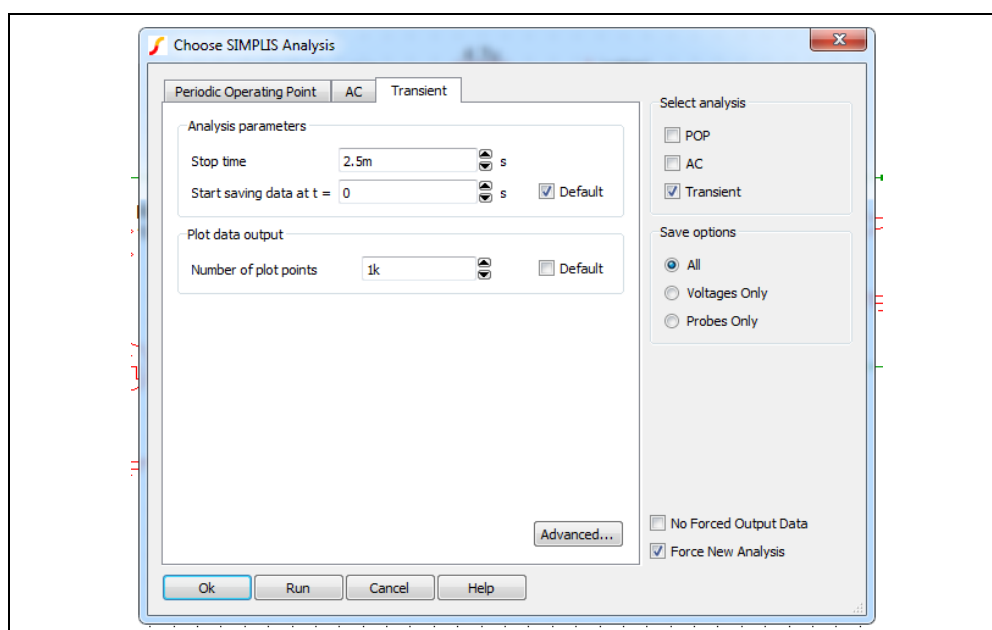


1.5 RUNNING THE SIMULATION

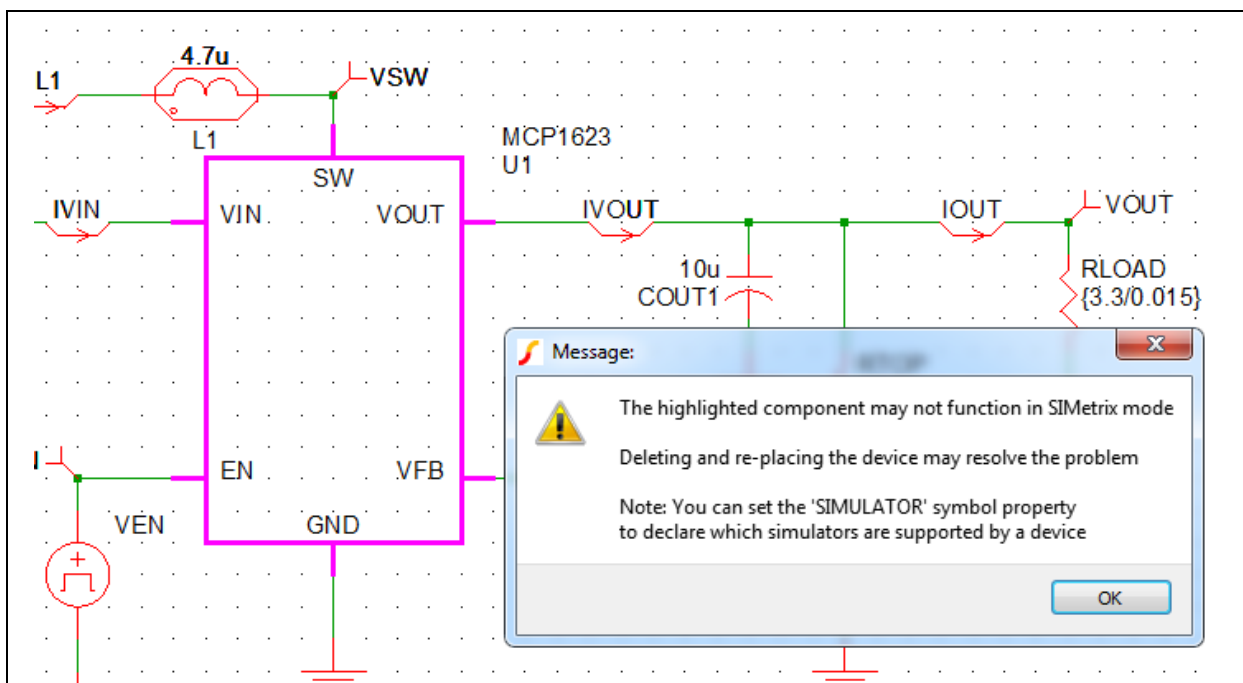
After opening an Microchip Technology Inc. application schematic, the user can run the default analysis by pressing the F9 key or by clicking on *Simulator>Run schematic*.



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-made schematic, the analysis type and its parameters must be chosen first.

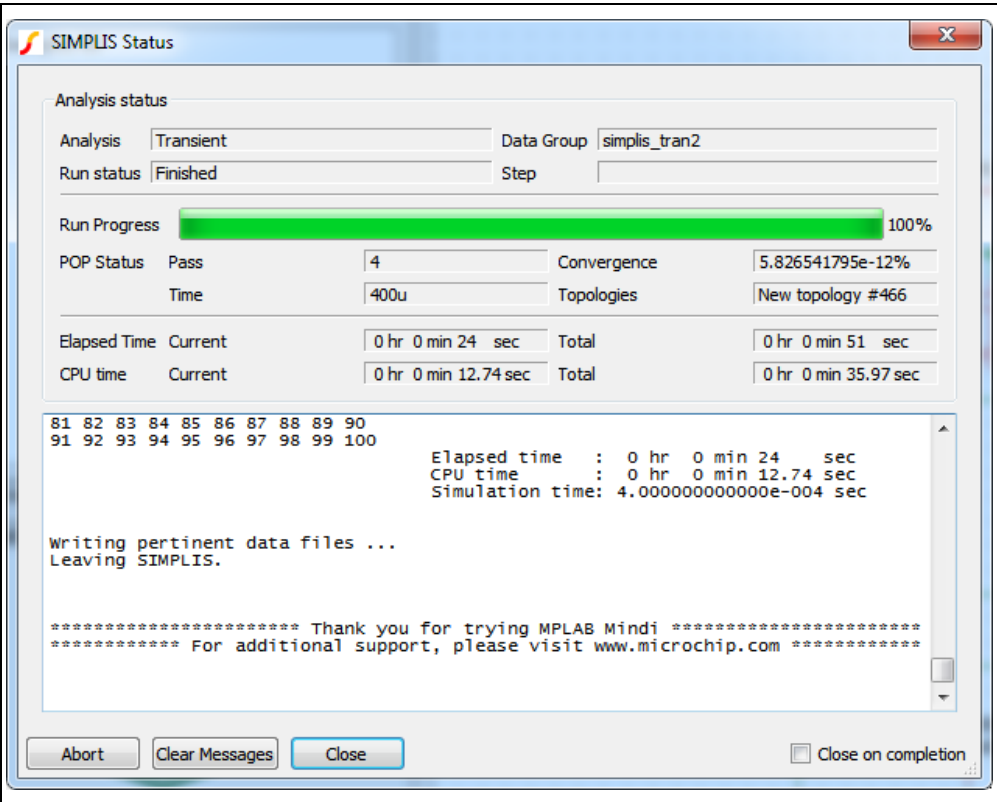


The analysis options for SIMPLIS and SIMetrix are different and the models are not compatible from one tool to the other. If the user wants to run a SIMPLIS schematic using the SIMetrix tool (or vice versa) the MPLAB® MINDI™ Simulator will issue a warning and will highlight the non-compatible parts.



1.6 SIMULATION RESULTS

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

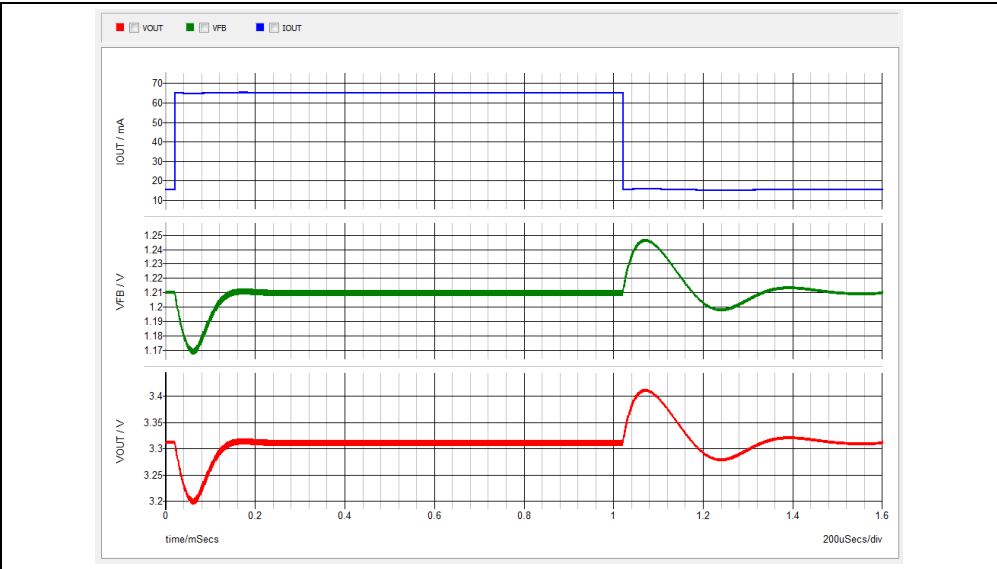


After the simulation is finished, the results will pop up.

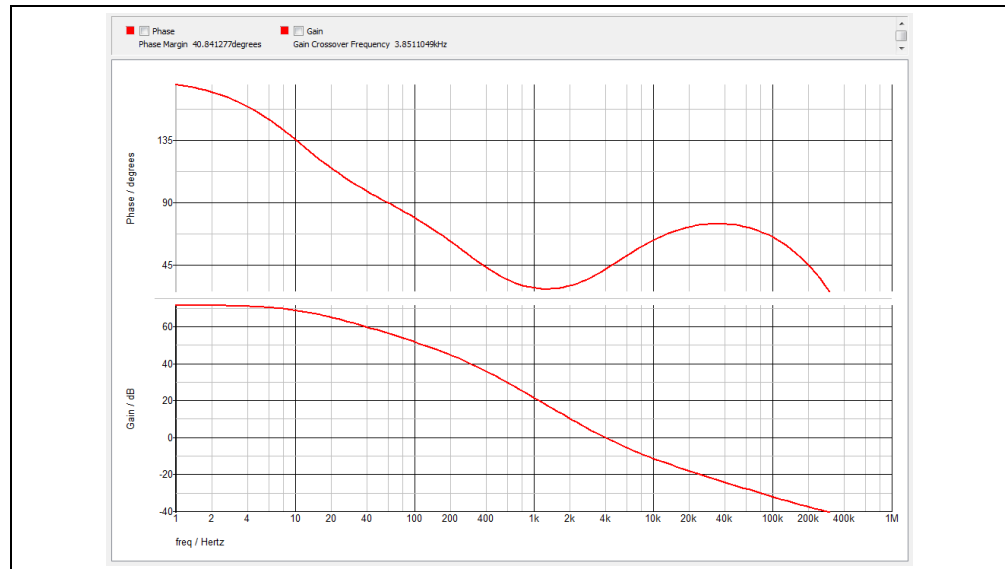
Note: The schematic must have signal probes that are consistent with the analysis type.

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.



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.



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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Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
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