AgileSwitch® Digital Programmable Gate Drivers Quick Start Guide

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ISBN: 978-1-5224-6669-7

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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 website (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 on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the AgileSwitch Digital Programmable Gate Drivers. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document provides the basics of how to use the AgileSwitch Digital Programmable Gate Drivers as a development tool for system designers. The manual layout is as follows:

- **Chapter 1. "Getting Started"** – Contains important information about the equipment and software needed for using the AgileSwitch Digital Programmable Gate Drivers.
- **Chapter 2. "Gate Driver Configuration and Programming"** – Includes instructions on the AgileSwitch Digital Programmable Gate Drivers' configuration and programming.
- **Chapter 3. "Testing"** – Details several gate driver testing scenarios and includes information on system installation.
- **Appendix A. "MPLAB® X IPE Programming Instructions"** – Details the steps needed to program the selected PIC® device with the help of the MPLAB X IPE (Integrated Programming Environment).

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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) { ... }`

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RECOMMENDED READING

This quick start guide describes the basics of using the AgileSwitch Digital Programmable Gate Drivers and is recommended to be used alongside the following Microchip document listed below, which is available and recommended as a supplemental reference resource:

- ***"2 ASC Gate Drivers AgileSwitch® Intelligent Configuration Tool User's Guide"*** **(DS50003039)**

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website 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
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- Field Application Engineer (FAE)
- Subject Matter Expert Engineers (SMEs)
- Technical Support

Customers should contact their distributor, representative, field application engineer (FAE) or Subject Matter Expert Engineers (SME) 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 website at:
http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (August 2020)

- Initial release of this document.
- Converted *"AgileSwitch® Intelligent Configuration Tool – Quick Start Guide"* document to Microchip user's guide template.

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Chapter 1. Getting Started

1.1 ABSTRACT

AgileSwitch Digital Programmable Gate Drivers offer multiple levels of software configurability that allow system designers to fine-tune performance to their specific systems and applications.

This Quick Start Guide will define the hardware and software required to get started, as well as the overall process of configuring a gate driver to your application. For more detailed information on software-configurable parameters, including individual parameter ranges and recommended settings where appropriate, please refer to the *"2 ASC Gate Drivers AgileSwitch® Intelligent Configuration Tool User's Guide"* (DS50003039).

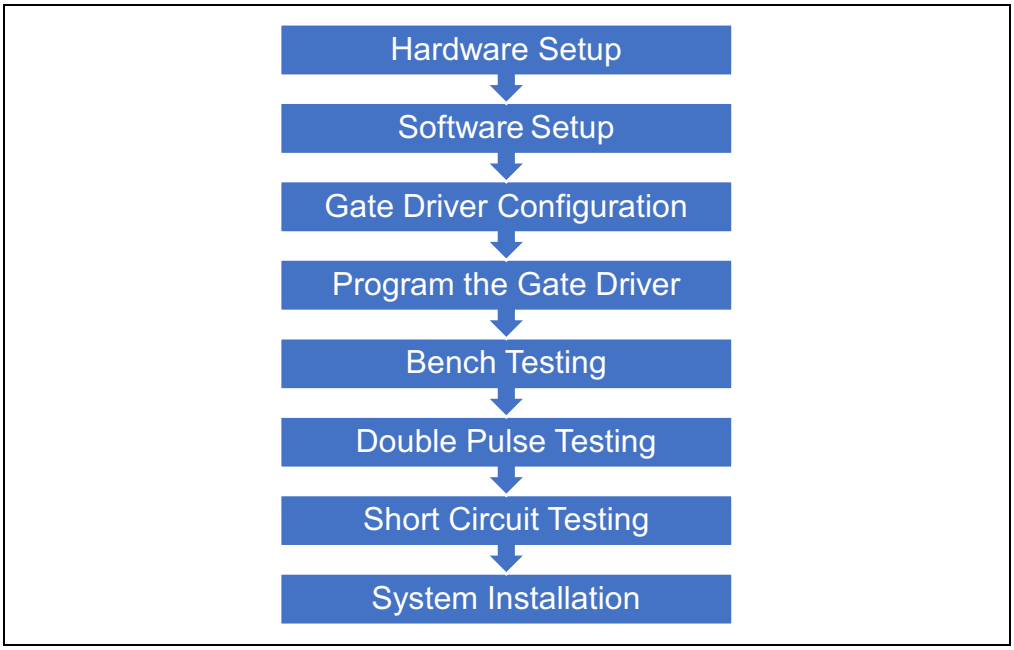

FIGURE 1-1: *Overall Configuration Process at a Glance.*

1.2 EQUIPMENT AND SOFTWARE

TABLE 1-1: HARDWARE SETUP

Qty.	Description	Manufacturer	Part Number	Notes
1	Windows® 7 or better PC	—	—	
1	Gate Driver	AgileSwitch®	2ASC-12A1HP, 2ASC-17A1HP, 62EM1	
1	Device Programmer	AgileSwitch	ASBK-007	Connects PC to Gate Driver
1	Module Board	AgileSwitch	62CA1, 62CA2, 62CA4, EDCA1, EDCA2	Or Own Design

TABLE 1-2: SOFTWARE SETUP

Qty.	Description	Manufacturer	Part Number	Notes
1	MPLAB® X IPE	Microchip Technology Inc.	MPLAB X IPE v5.05	http://www.agileswitch.com/program.html
1	Intelligent Configuration Tool	AgileSwitch®	CT – 2ASC-12A1HP, ICT – 62EM1	

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Chapter 2. Gate Driver Configuration and Programming

2.1 GATE DRIVER CONFIGURATION

Open the ICT – 2ASC-12A1HP.

Follow the *"2 ASC Gate Drivers AgileSwitch® Intelligent Configuration Tool User's Guide"* – 2ASC-12A1HP for detailed instructions.

2.2 PROGRAM THE GATE DRIVER

Open MPLAB® X IPE.

Follow the **Appendix A. "MPLAB® X IPE Programming Instructions"** for detailed instructions.

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Chapter 3. Testing

3.1 ABSTRACT BENCH TESTING

AgileSwitch highly recommends bench testing the setup prior to applying any high voltage. This will ensure that the settings selected in the ICT and the actual output are as expected.

3.2 DOUBLE PULSE TESTING

Double Pulse Testing is a valuable test to characterize your system for DC link voltage overshoot and switching efficiency.

AgileSwitch offers recommended settings for several SiC modules based on its characterization. These settings can be used as a starting point for your system characterization. The recommended settings are included with the ICT download.

There is a detailed testing procedure located in the *"2 ASC Gate Drivers AgileSwitch® Intelligent Configuration Tool User's Guide"* – 2ASC-12A1HP.

3.3 DSAT (SHORT-CIRCUIT) TESTING

DSAT (Short-Circuit) Testing will simulate a short-circuit condition. This will allow the user to verify that the selected settings will protect the SiC module based on the system specifications.

AgileSwitch offers recommended settings for several SiC modules that have been characterized. These can be used as a starting point for your system characterization. The recommended settings are included with the ICT download.

There is a detailed testing procedure located in the *"2 ASC Gate Drivers AgileSwitch® Intelligent Configuration Tool User's Guide"* – 2ASC-12A1HP.

3.4 SYSTEM INSTALLATION

After completing these steps, you are ready to install the board(s) into your system for full load testing.

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Appendix A. MPLAB® X IPE Programming Instructions

A.1 EQUIPMENT AND SOFTWARE

TABLE A-1: SOFTWARE REQUIRED

Item Name	Link
MPLAB® X IPE (Integrated Programming Environment)	Download

TABLE A-2: HARDWARE REQUIRED

Part Number	Item Name	Description
ASBK-014	Device Programmer	PICkit™ 4 with Adapter Board and Cables

A.2 PROCEDURE

1. Connect the MPLAB® PICkit™ 4 to the computer using the supplied Micro-B USB cable.
2. Plug the ASB-014 Adapter Board into the PICkit 4 Programmer.
3. Connect the Adapter Board to the Gate Driver using the appropriate cables:

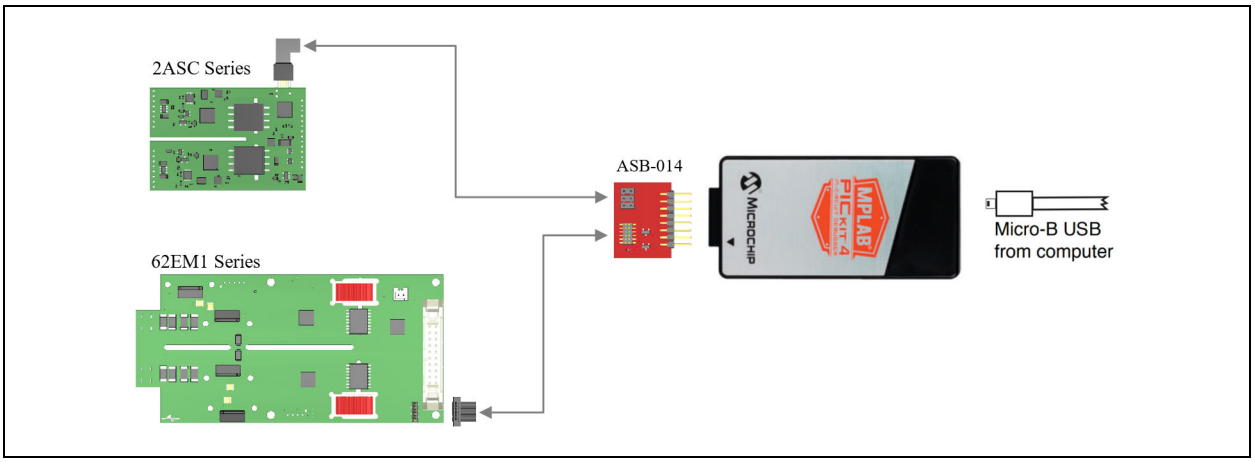

FIGURE A-1: *Hardware Setup.*

4. Supply power to the Gate Driver by using only one of the methods below:
   a) External supply provided by user, or
   b) Power Target from PICkit 4 (*Settings>Advanced>Power*)

CAUTION
Do not use both methods at the same time. This risks damage to the device.

5. Open the MPLAB X IPE software.
6. Select the appropriate PIC device to program and click **Apply**.

TABLE A-3: PIC® DEVICE SELECTION

Part Number	PIC Device
2ASC-12A1HP	PIC16F1776
2ASC-17A1HP	PIC16F1776
62EM1	PIC16F1773

7. Click the **Connect** button to connect the PICkit 4.
8. Use **Browse** to load the `.hex` programming file.
9. Click on **Program** to flash the device.

For additional details, please visit www.microchip.com/pickit4.

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