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**MTD6501G  
12V 3-Phase BLDC  
Sensorless Fan Controller  
Daughter Board User's Guide  
(ADM00534)**

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# MTD6501G 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD USER'S GUIDE

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**NOTES:**

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**Object of Declaration: MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board**

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.  
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This declaration of conformity is issued by the manufacturer.

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This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

  
Derek Carlson  
VP Development Tools

12-Sep-14  
Date

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# MTD6501G 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD USER'S GUIDE

## 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](http://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 MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board (ADM00534). 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 describes how to use the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board as an evaluation tool to debug on a target motor system. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Important information about the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Chapter 2. “Installation and Operation”** – Includes instructions on how to get started with the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix A. “Schematics and Layouts”** – Shows the schematic and layout diagrams for the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix B. “Bill of Materials (BOM)”** – Lists the parts used to build the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

### DOCUMENTATION CONVENTIONS

Description	Represents	Examples
<b>Arial font:</b>		
Italic characters	Referenced books	<i>MPLAB<sup>®</sup> 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&gt;Save</i></u>
Bold characters	A dialog button	Click <b>OK</b>
	A tab	Click the <b>Power</b> 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>
<b>Courier New font:</b>		
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) { ... }



## RECOMMENDED READING

This user's guide describes how to use the MTD6501G 12V3-Phase BLDC Sensorless Fan Controller Daughter Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **MTD6501C/D/G Data Sheet** – “*3-Phase Brushless DC Sinusoidal Sensorless Fan Motor Driver*” (DS22263)
- **MCP8063 Data Sheet** – “*3-Phase Brushless Sinusoidal Sensorless Motor Driver*” (DS20005257)
- **MCP8063 User Guide** – “*12V 3-Phase BLDC Sensorless Fan Controller Demonstration Board*” (DS50002248)

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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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- 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 website at:  
<http://www.microchip.com/support>.

## DOCUMENT REVISION HISTORY

### Revision A (September 2016)

- Initial release of this document.

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**NOTES:**

## Chapter 1. Product Overview

### 1.1 INTRODUCTION

In order to easily use the MTD6501 device, Microchip provides daughter boards for each MTD6501 device version: MTD6501D, MTD6501G and MTD6501C daughter boards. This document covers the MTD6501G Daughter Board.

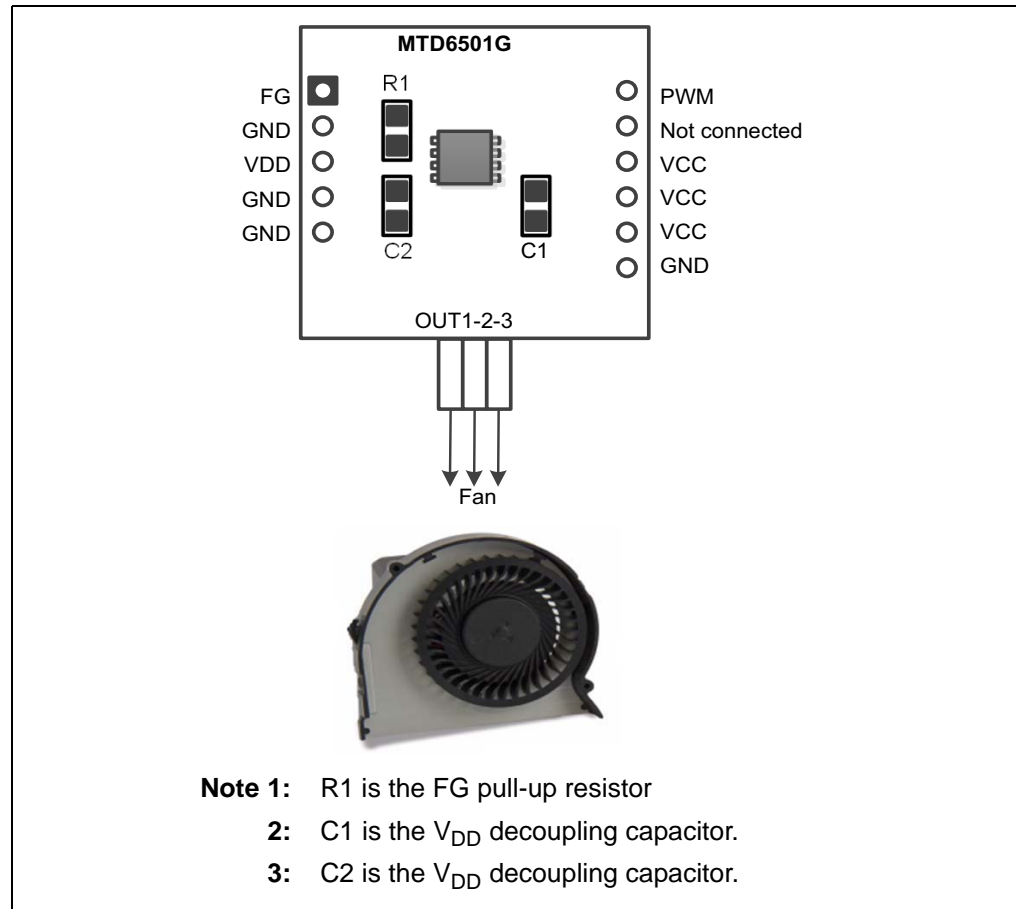
The MTD6501G Daughter Board is a small board with the minimum required components that are necessary to operate the MTD6501G device.

The MTD6501G Daughter Boards are designed to be used with the ADM00532 motherboard, but can also be used as standalone boards using their connectors.

The MTD6501G Daughter Boards come with a kit of three boards.

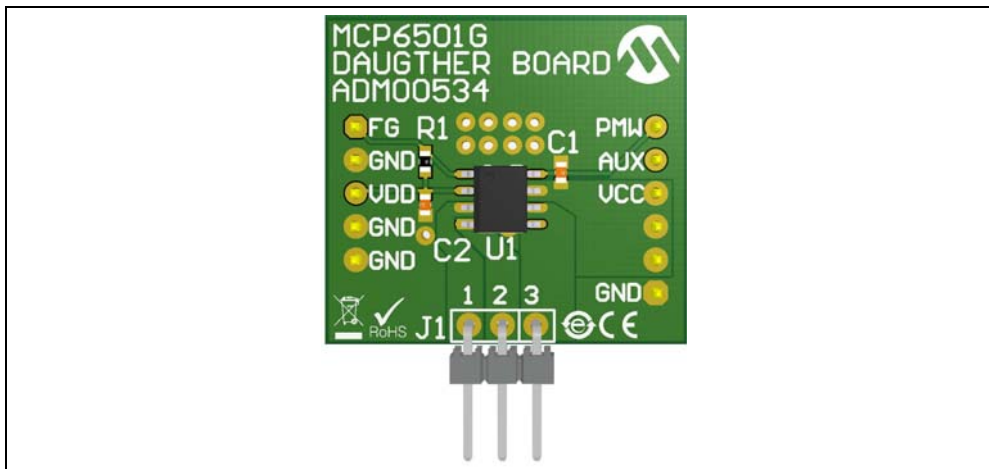
**Note:** In order to operate with a 3-phase BLDC motor, ensure you have direct access to the three phases (also called U, V, W) of the motor. See [Figure 1-3](#).

The MTD6501G Daughter Board footprint and connections are represented in [Figure 1-1](#).



**FIGURE 1-1:** MTD6501G Daughter Board Footprints and Connectors.

The board overview is represented in [Figure 1-2](#).



**FIGURE 1-2:** Existing MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.

For more information, see [Appendix A. “Schematics and Layouts”](#).

## 1.2 MTD6501G DAUGHTER BOARD FEATURES

The MTD6501G Daughter Board can be used as standalone board (see [Section 2.1 “Getting Started”](#)) but it is strongly recommended to use the MTD6501G Daughter Board with the help of the MCP8063 12V 3-Phase BLDC Sensorless Fan Controller Demonstration Board (ADM00532).

The MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board allows the control and monitoring of Microchip 12V fan driver devices, such as the MCP8063 or MTD6501. The MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board is controlled through PC software, via a USB connection.

The MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board's Software provides several features, such as:

- Fan driver power supply control and monitoring
- Pulse-width modulation (PWM) control
- Speed and current consumption monitoring
- Automatic application testing.

See more information about the MCP8063 kit on the Microchip website.

Figure 1-3 shows how the software, the board and the fan interact with one another.

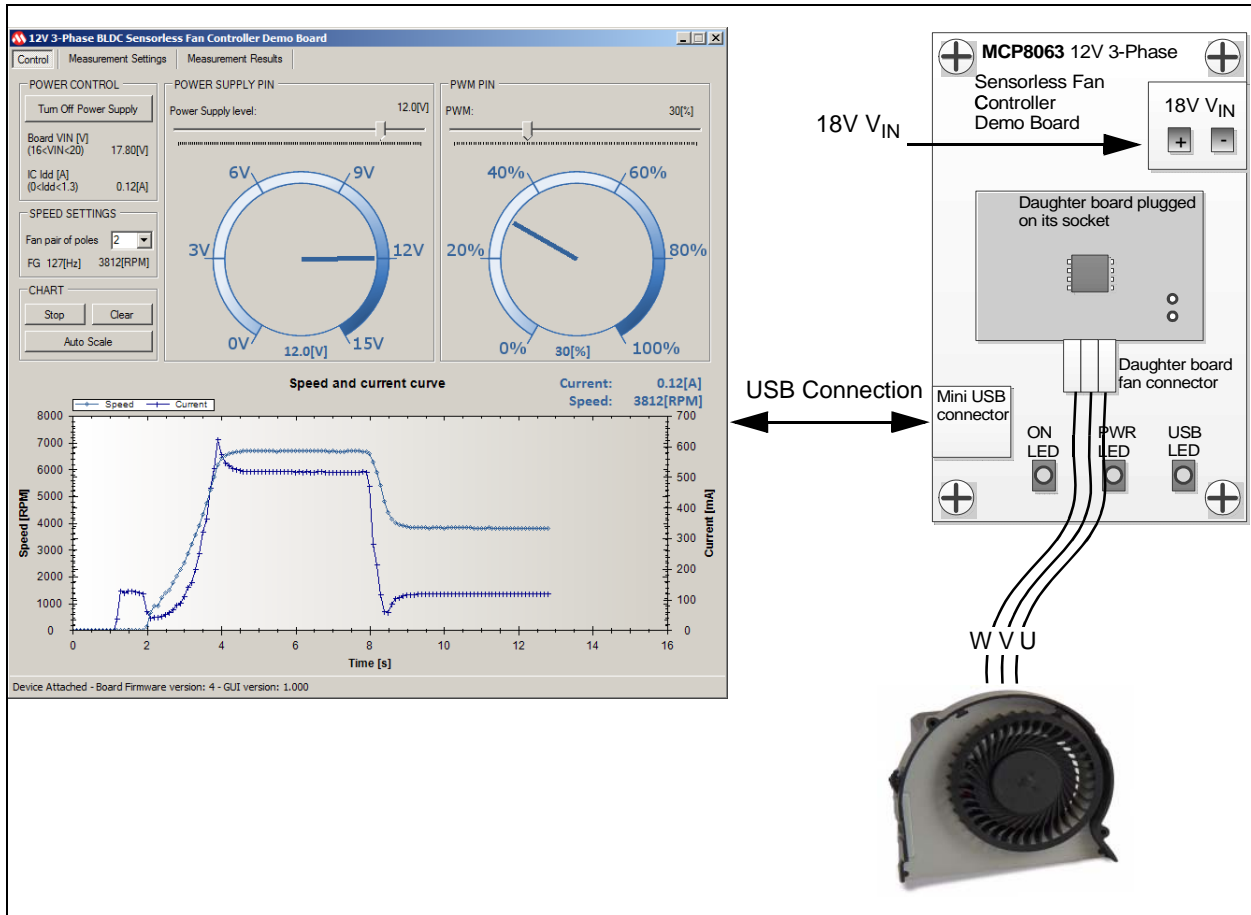


FIGURE 1-3: System Overview.

### 1.3 WHAT THE MTD6501G 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD INCLUDES

Depending on the daughter board version, the MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board includes:

- MTD6501G Daughter Board (ADM00534)
- Important Information Sheet

**NOTES:**

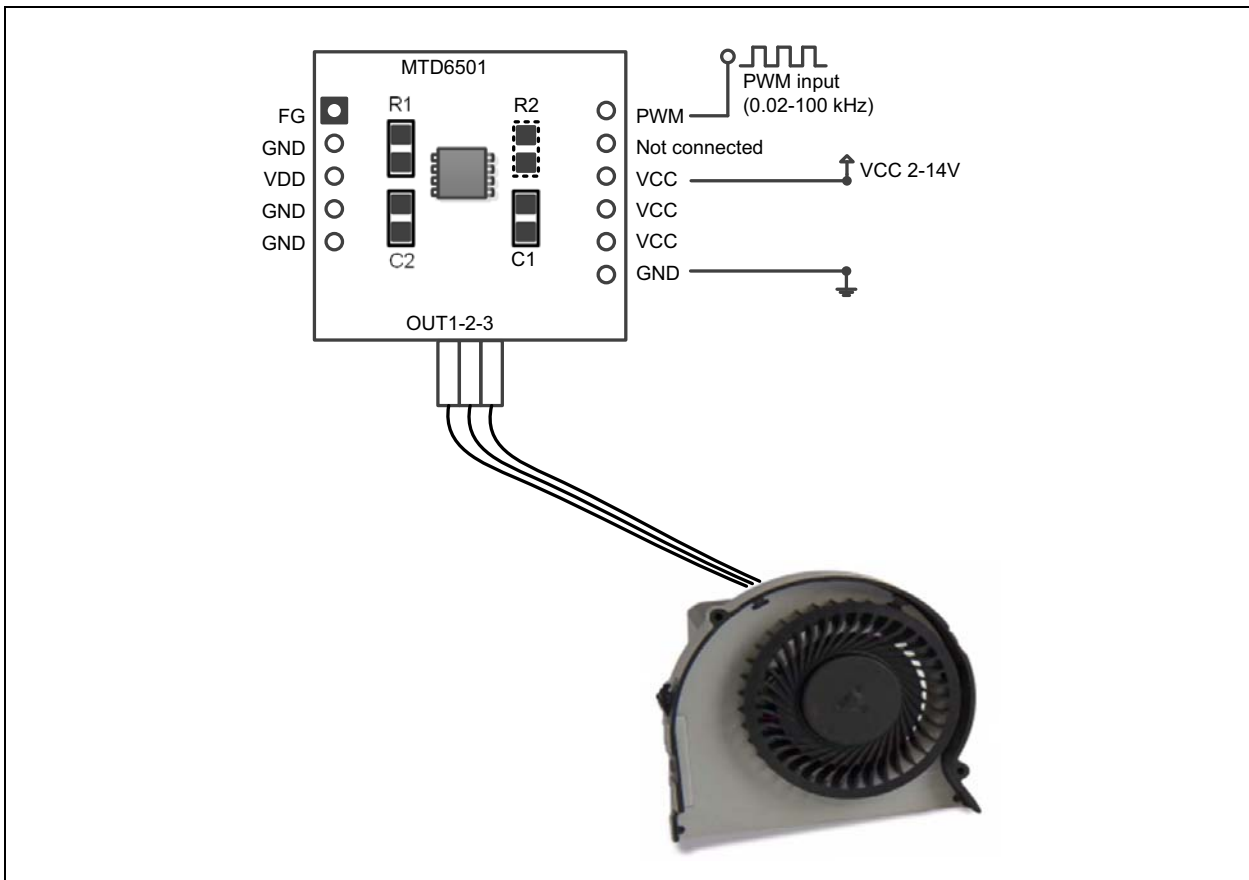
## Chapter 2. Installation and Operation

### 2.1 GETTING STARTED

In Standalone mode, a power supply (2V to 14V) is required to supply the board using the VCC and the GND connector, to operate with the daughter boards. Ensure that the power supply can provide enough current for the application (maximum is 800 mA).

A function generator with the frequency range of 0.02 kHz to 100 kHz can be used for the PWM pin. The PWM pin can be driven open-drain (internal pull) or logic 0V-3V. The PWM pin can be left open in order to operate with a PWM = 100%. The FG pin allows the electrical speed of the motor to be read. The assembled R1 resistor is used as a pull-up to VDD, so the signal will switch between 0V and 3V.

Figure 2-1 shows the connection to operate the MTD6501 Daughter Board.



**FIGURE 2-1:** MTD6501 Daughter Board Operation.

**NOTES:**





# MTD6501G 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD USER'S GUIDE

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## Appendix A. Schematics and Layouts

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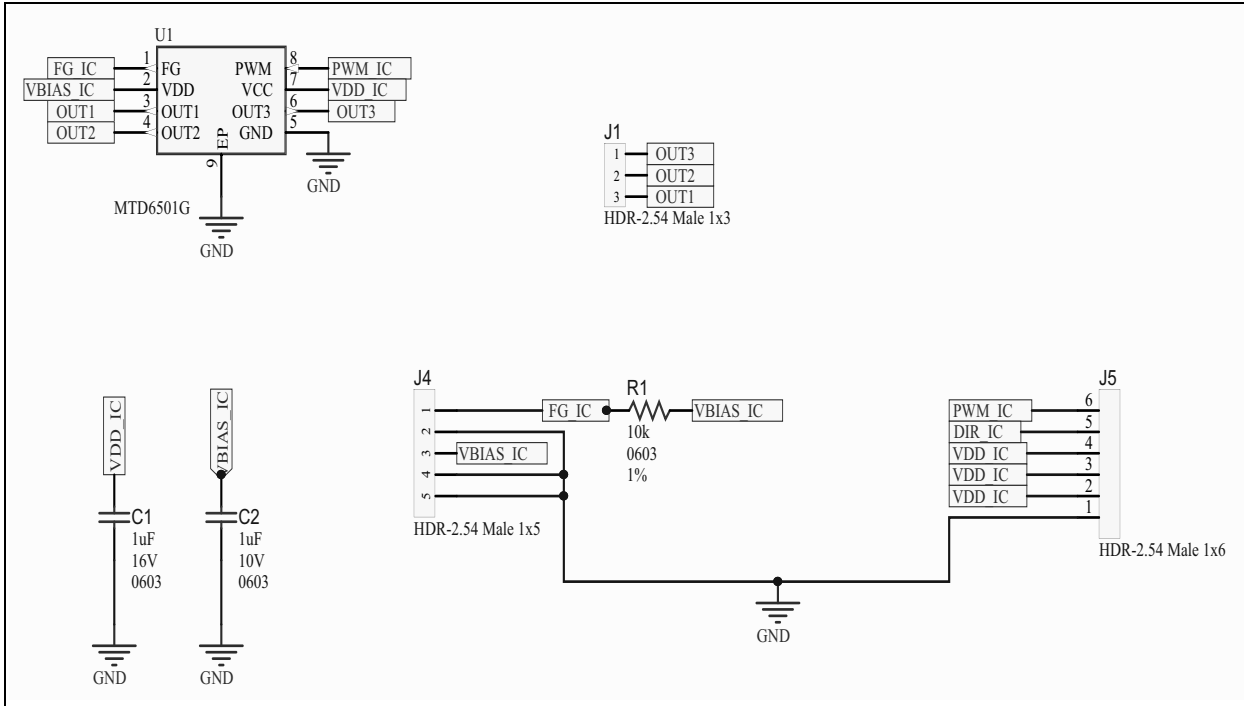
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### A.1 INTRODUCTION

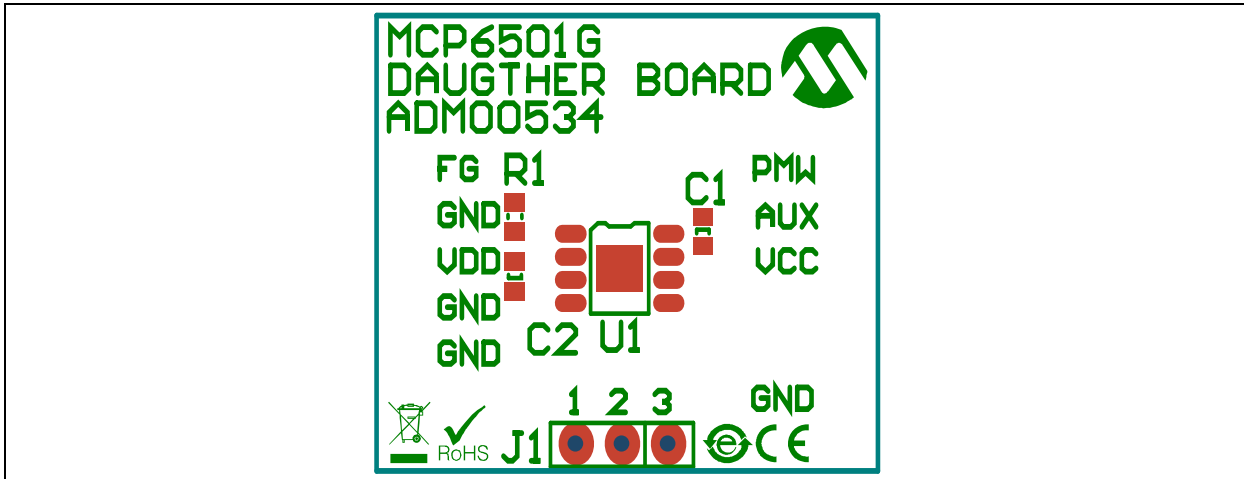
This appendix contains the schematics and layouts for the following devices which are included in the MTD6501G 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board:

- **MTD6501G Daughter Board (ADM00534):**
  - [MTD6501G Daughter Board – Schematic](#)
  - [MTD6501G Daughter Board – Top Silk](#)
  - [MTD6501G Daughter Board – Top Copper and Silk](#)
  - [MTD6501G Daughter Board – Top Copper](#)
  - [MTD6501G Daughter Board – Bottom Copper](#)
  - [MTD6501G Daughter Board – Bottom Copper and Silk](#)
  - [MTD6501G Daughter Board – Bottom Silk](#)

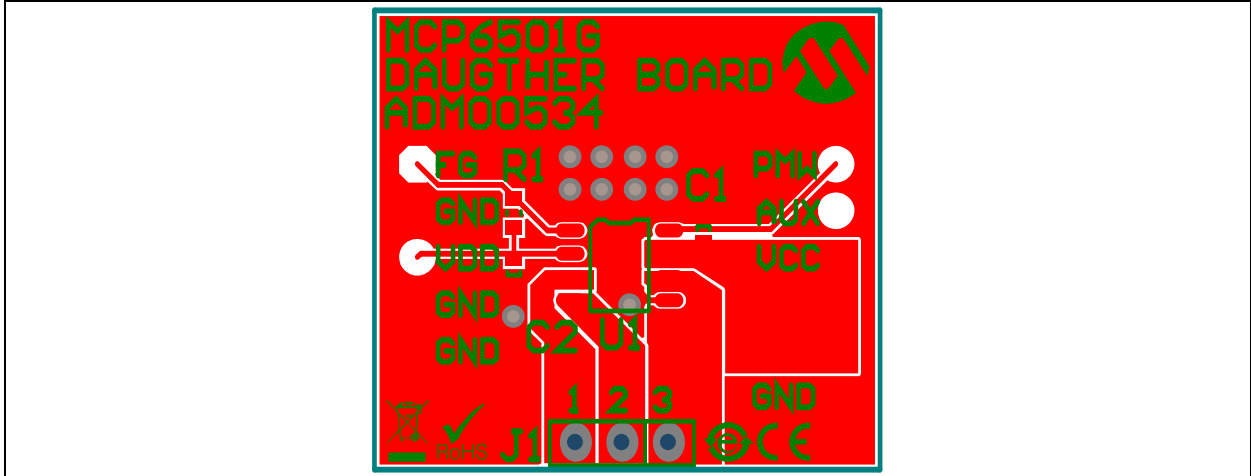
## A.2 MTD6501G DAUGHTER BOARD – SCHEMATIC



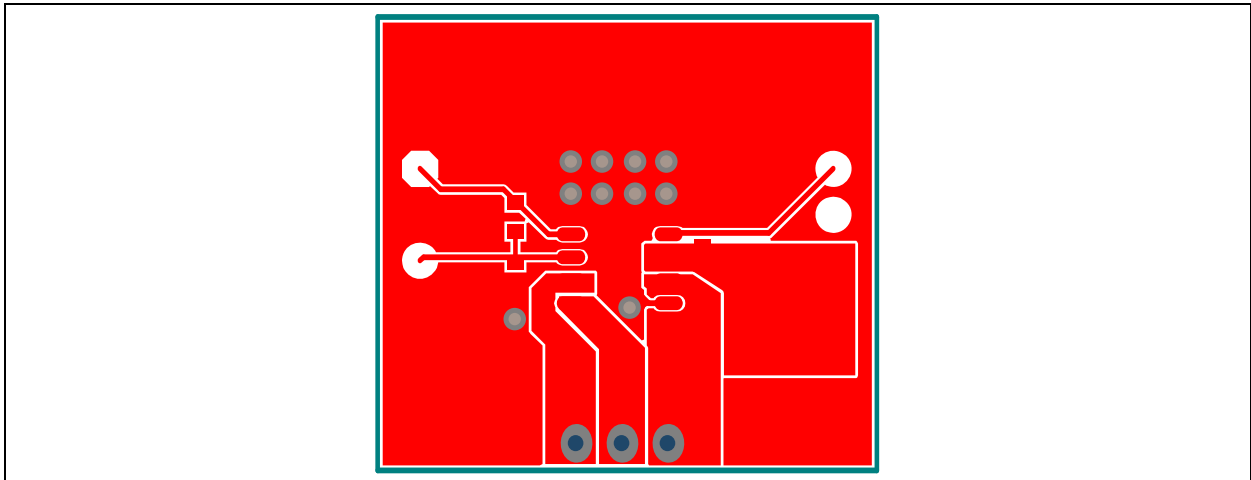
## A.3 MTD6501G DAUGHTER BOARD – TOP SILK



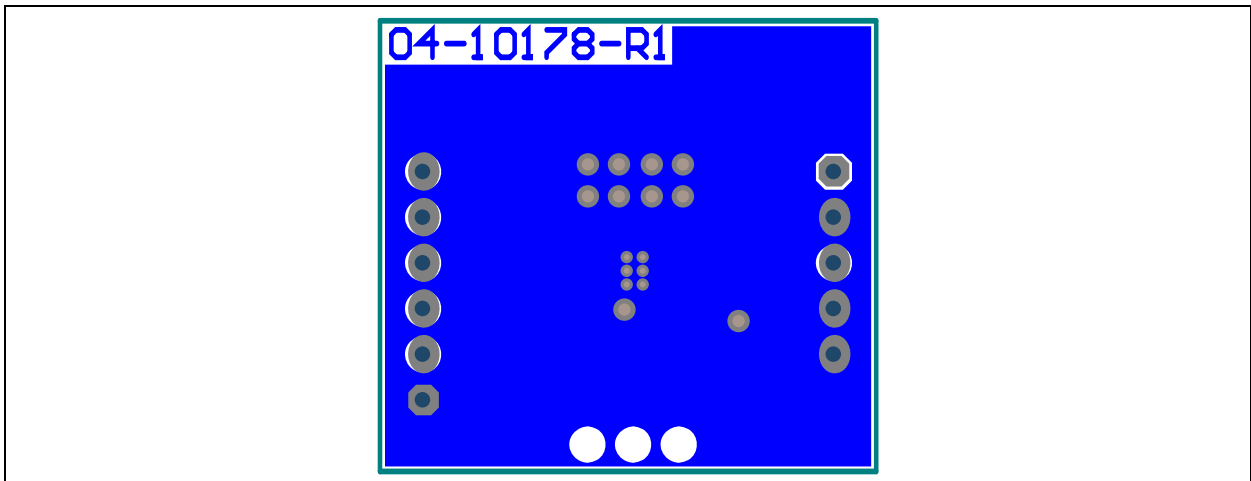
#### A.4 MTD6501G DAUGHTER BOARD – TOP COPPER AND SILK



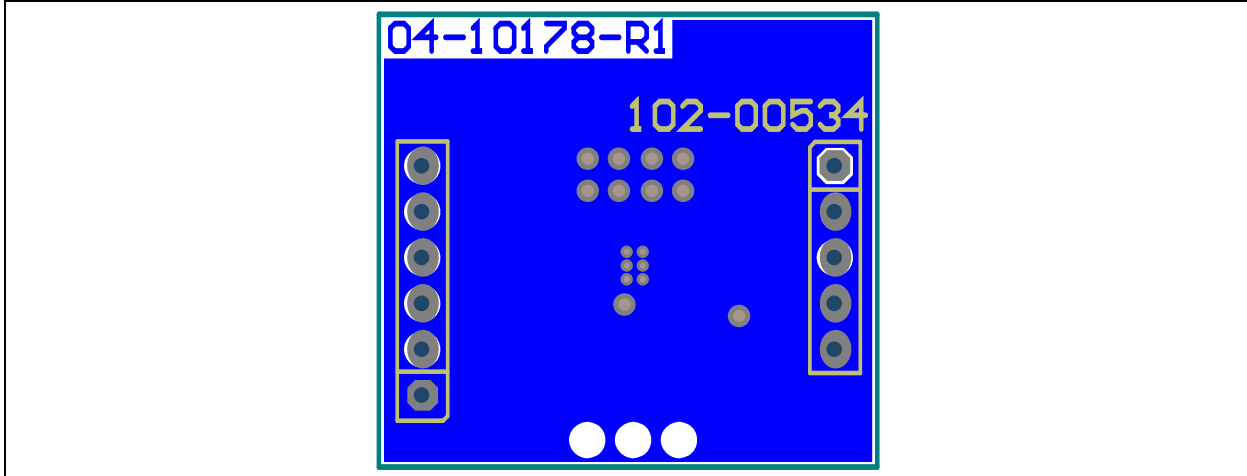
#### A.5 MTD6501G DAUGHTER BOARD – TOP COPPER



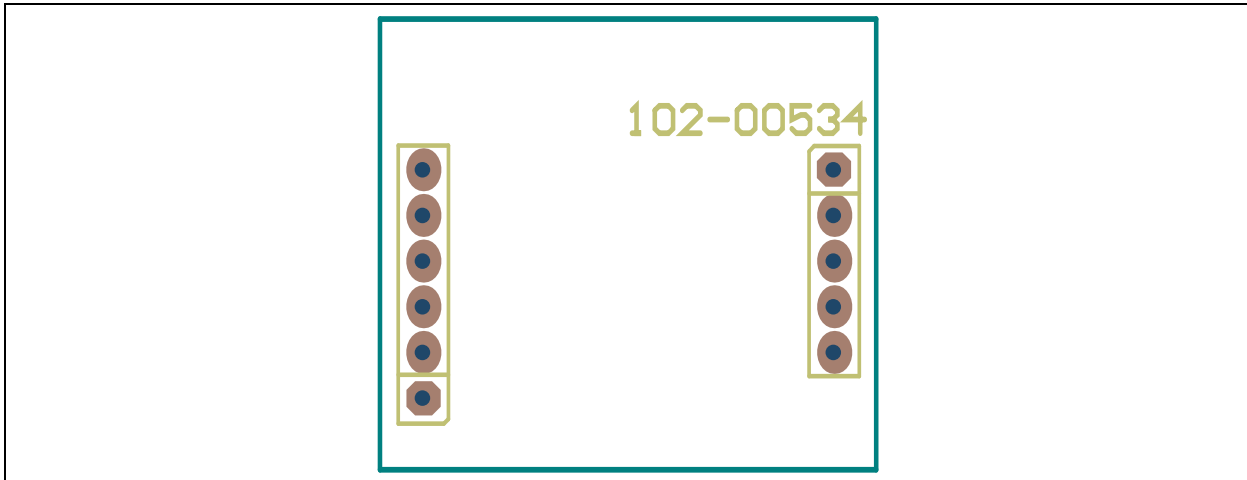
#### A.6 MTD6501G DAUGHTER BOARD – BOTTOM COPPER



**A.7 MTD6501G DAUGHTER BOARD – BOTTOM COPPER AND SILK**



**A.8 MTD6501G DAUGHTER BOARD – BOTTOM SILK**





**MTD6501G 12V 3-PHASE BLDC SENSORLESS  
FAN CONTROLLER DAUGHTER BOARD  
USER'S GUIDE**

**Appendix B. Bill of Materials (BOM)**

**TABLE B-1: BILL OF MATERIALS (BOM) - MTD6501G DAUGHTER BOARD (ADM00534)**

Qty	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor ceramic 1 $\mu$ F 16V 10% X7R SMD 0603	Taiyo Yuden Co., Ltd.	EMK107B7105KA-T
1	C2	Capacitor ceramic 1 $\mu$ F 10V 20% X7R SMD 0603	TDK Corporation	C1608X7R1A105M
1	J1	Connector Header-2.54 Male 1x3 Tin 6.2 MH TH. R/A	Molex <sup>®</sup>	0022288030
1	J4	Connector Header-2.54 Male 1x5 Gold 5.84 MH TH. vertical	Samtec, Inc.	TSW-105-07-S-S
1	J5	Connector Header-2.54 Male 1x6 Gold 5.84 MH TH. vertical	FCI	68001-106HLF
1	PCB1	Printed Circuit Board	—	04-10177
1	R1	Resistor TKF. 10k 1% 1/16W SMD 0603	SPC Technology	MCHP03W8F1002T5E
1	R2	Resistor TKF. 10k 1% 1/16W SMD 0603	SPC Technology	MCHP03W8F1002T5E
1	U1	Microchip Analog Motor Driver MTD6501G-LC1 MSOP-10	Microchip Technology, Inc.	<b>MTD6501G-LC1</b>

**Note 1:** The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.



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