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**MTD6501D
12V 3-Phase BLDC
Sensorless Fan Controller
Daughter Board User's Guide
(ADM00533)**

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MTD6501D 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD USER'S GUIDE

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NOTES:

Object of Declaration: MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board

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Manufacturer: Microchip Technology Inc.
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USA

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Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:



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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 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 MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board (ADM00533). 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 MTD6501D 12V 3-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 MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Chapter 2. “Installation and Operation”** – Includes instructions on how to get started with the MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix A. “Schematics and Layouts”** – Shows the schematic and layout diagrams for the MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix B. “Bill of Materials (BOM)”** – Lists the parts used to build the MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.

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) { ... }

RECOMMENDED READING

This user's guide describes how to use the MTD6501D 12V 3-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 Kit User’s Guide*” (DS50002248)

THE MICROCHIP WEBSITE

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- **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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- 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.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

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

The MTD6501D Daughter Board is a small board with the minimum components that are necessary to operate with the MTD6501D device.

The MTD6501D Daughter Boards are designed to be used with the ADM00532 motherboard, but can also be operated as standalone boards using their connectors.

The MTD6501D 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 MTD6501D Daughter Board footprint and connections are represented in [Figure 1-1](#).

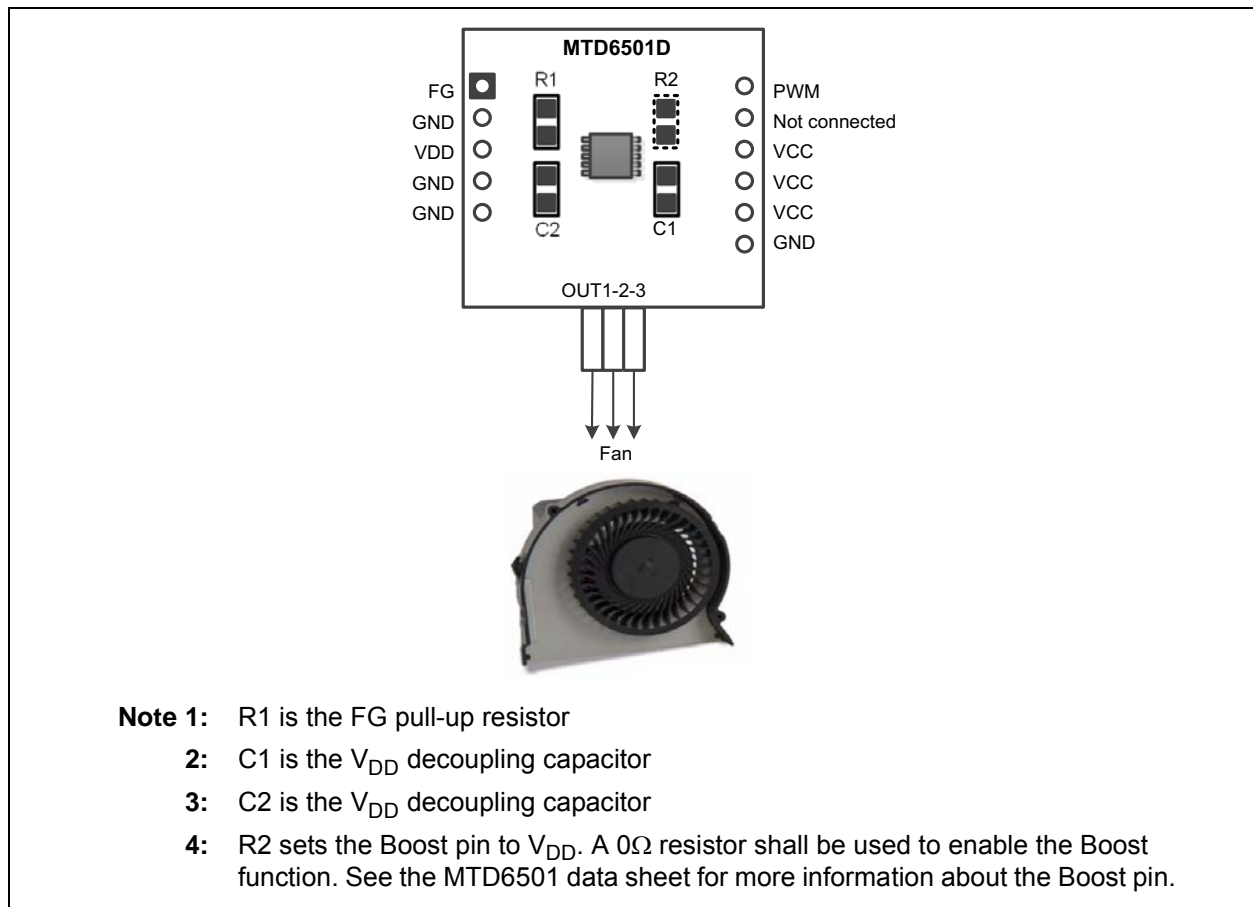


FIGURE 1-1: MTD6501D Daughter Board Footprint and Connections.

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

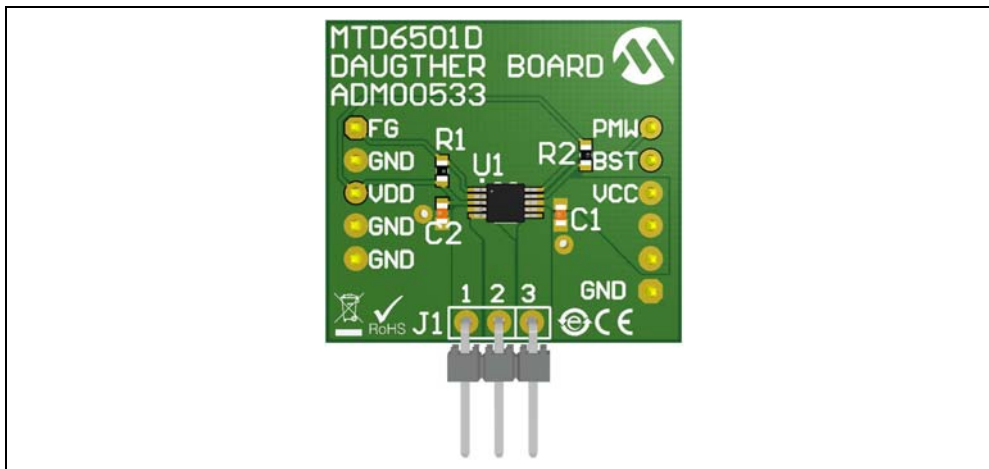


FIGURE 1-2: MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board User's Guide Overview.

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

1.2 MTD6501D DAUGHTER BOARD FEATURES

The MTD6501D Daughter Board can be used as standalone board (see [Section 2.1 "Getting Started"](#)) but it is strongly recommended to use the MTD6501D Daughter Board with the help of the MCP8063 12V 3-Phase BLDC Sensorless Fan Controller Demonstration Board (ADM00532).

The MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board Kit allows the control and monitoring of Microchip 12V fan driver devices, such as the MCP8063 or MTD6501. The MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board is controlled through PC software, via a USB connection.

The MTD6501D 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.

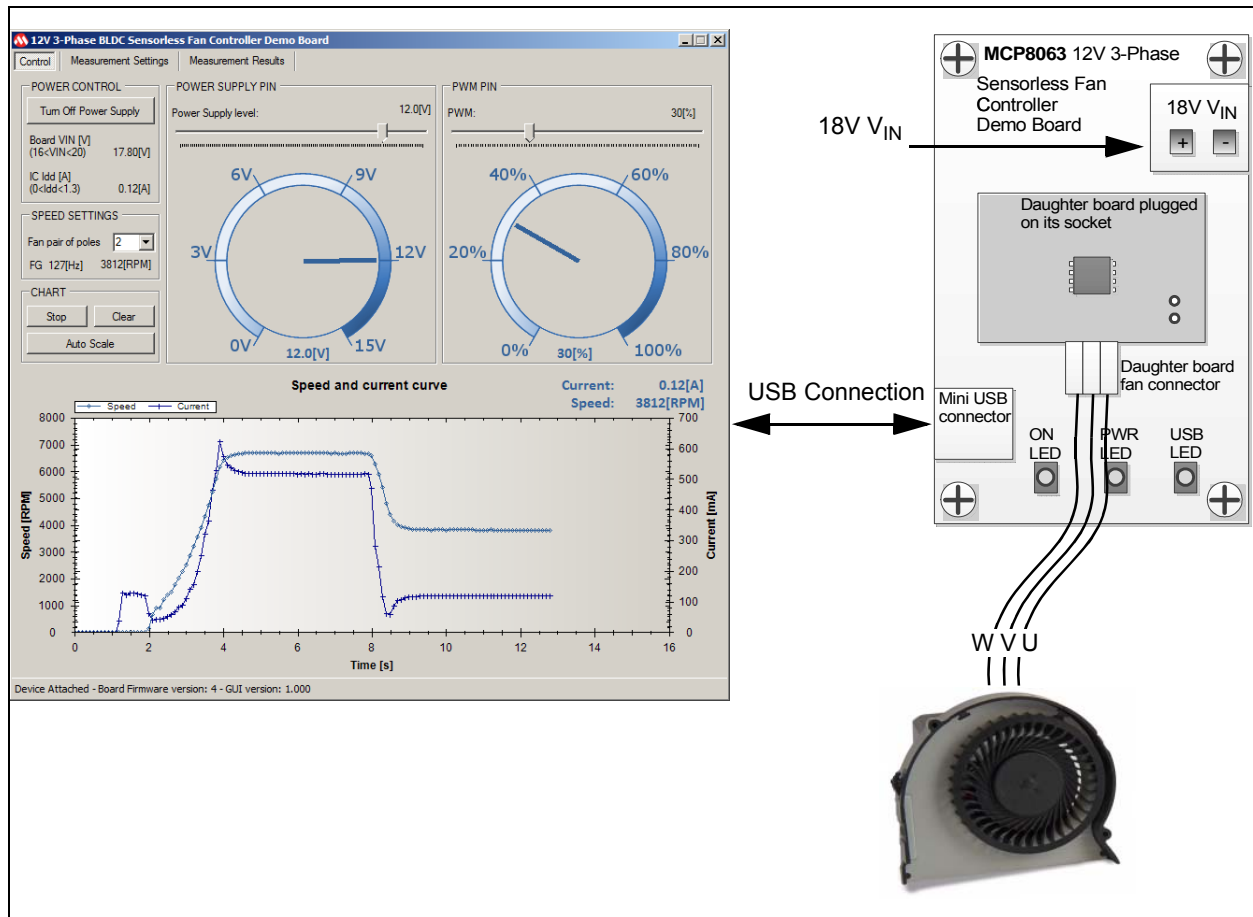


FIGURE 1-3: System Overview.

1.3 WHAT THE MTD6501D 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD KIT INCLUDES

Depending on the daughter board version, the MTD6501D 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board Kit includes:

- MTD6501D Daughter Board (ADM00533)
- 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.

Verify if the Boost pin has to be enabled. To enable the Boost pin, a 0Ω resistor should be assembled on the board in the R2 location. If the Boost pin does not need to be enabled, R2 should remain unpopulated. See the MTD6501 Data Sheet (DS22263B) for more information about the Boost pin. Connect the 3-phase BLDC motor before enabling the power supply.

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

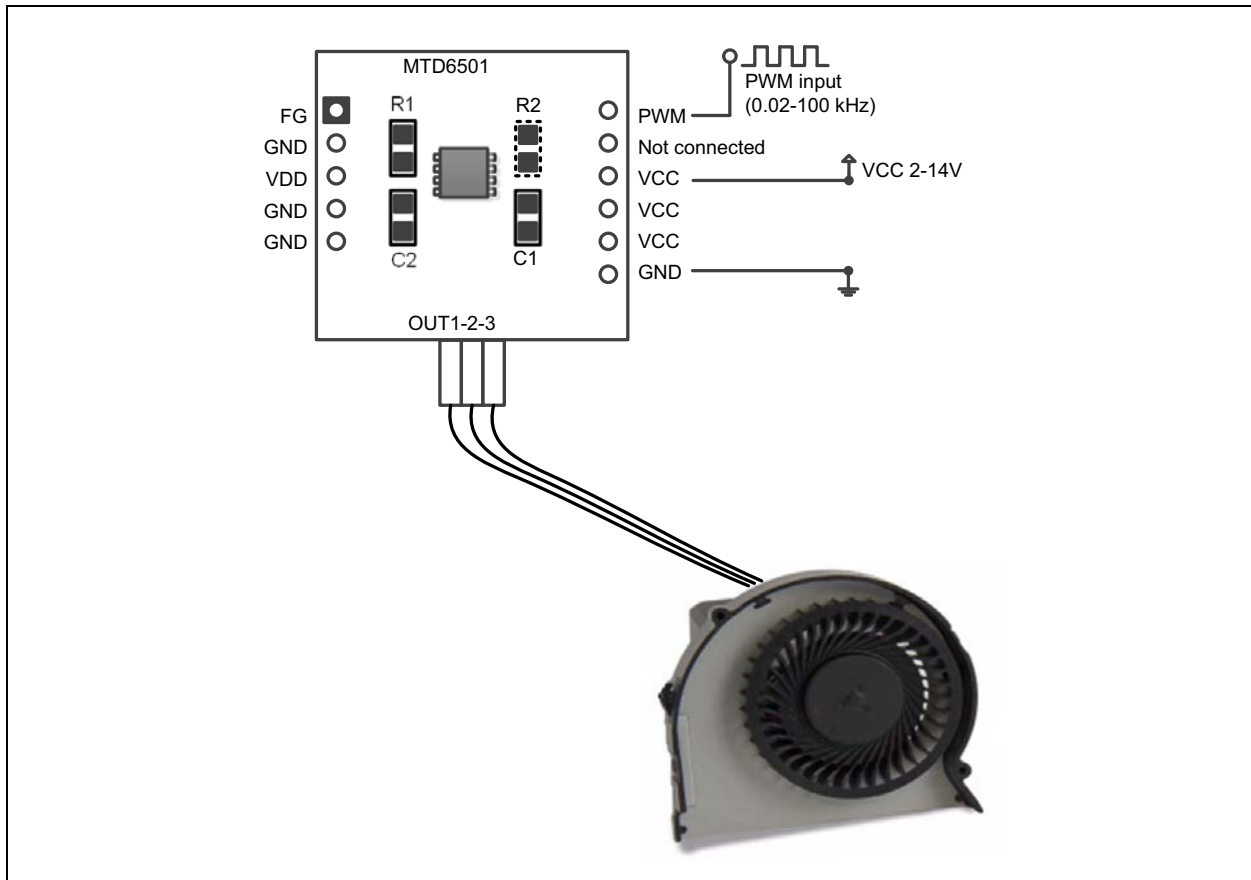


FIGURE 2-1: MTD6501 Daughter Board Operation.

NOTES:



MTD6501D 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD USER'S GUIDE

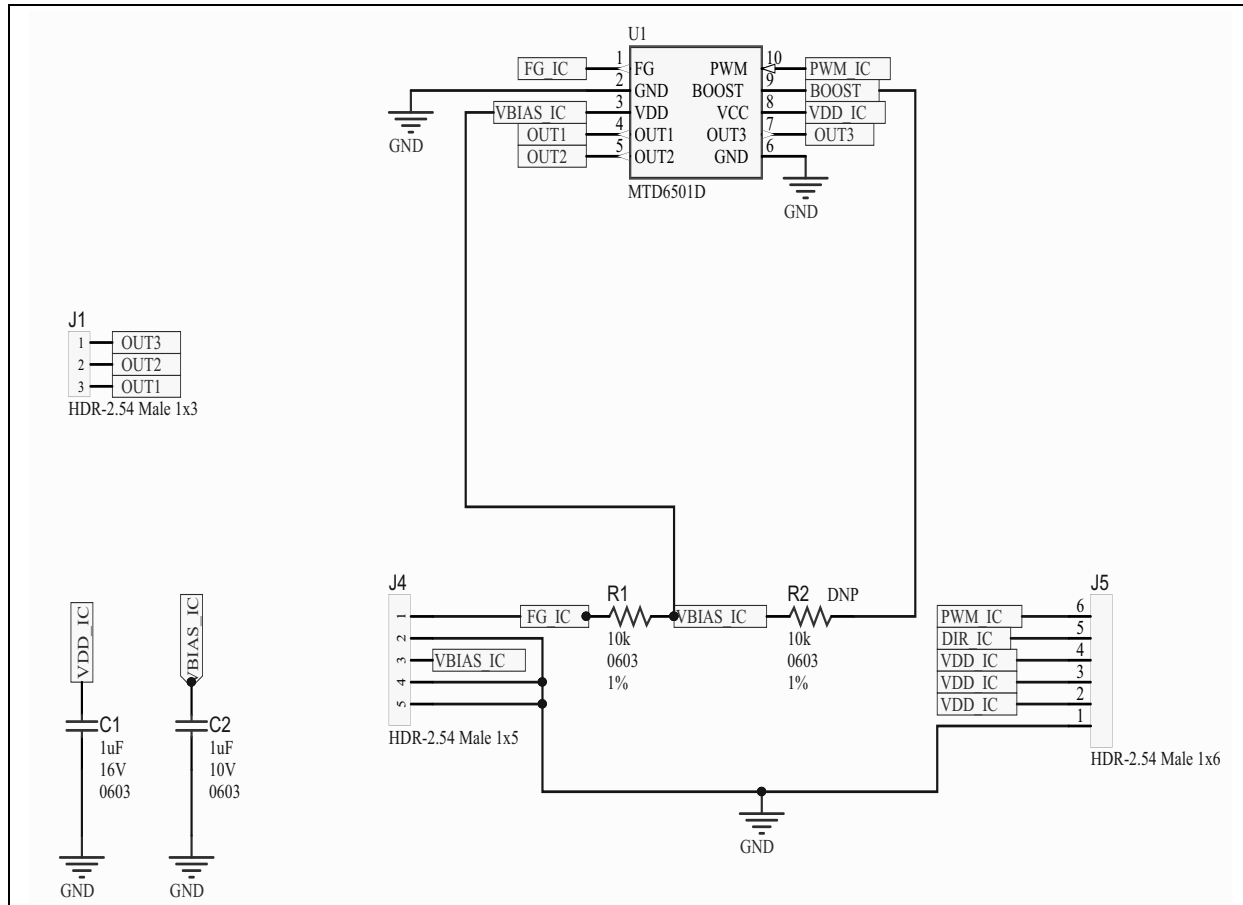
Appendix A. Schematics and Layouts

A.1 INTRODUCTION

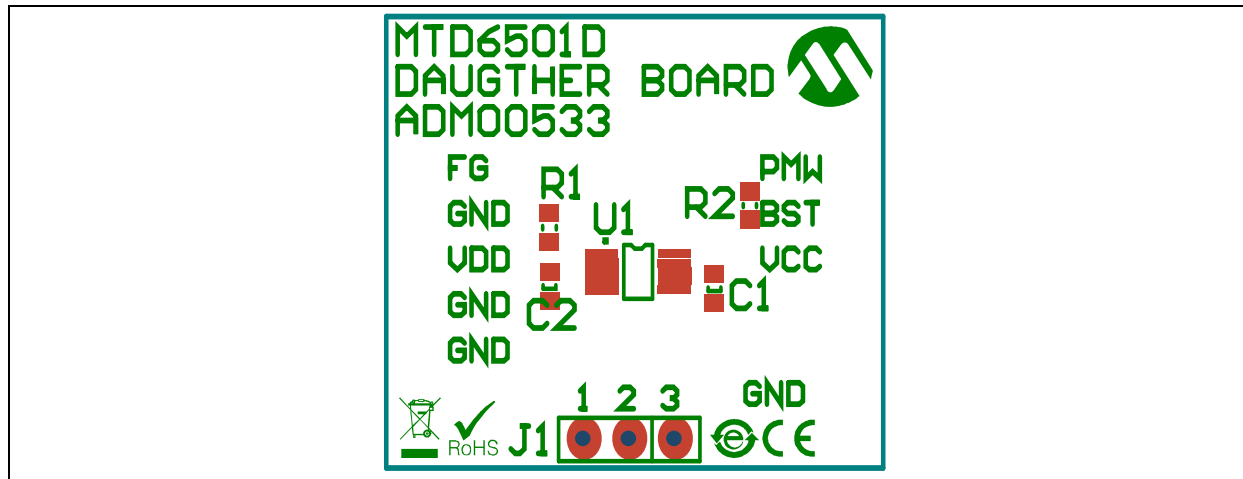
This appendix contains the schematics and layouts for the following device which is included in the MTD6501 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board:

- **MTD6501D Daughter Board (ADM00533)**
 - [MTD6501D Daughter Board – Schematic](#)
 - [MTD6501D Daughter Board – Top Silk](#)
 - [MTD6501D Daughter Board – Top Copper and Silk](#)
 - [MTD6501D Daughter Board – Top Copper](#)
 - [MTD6501D Daughter Board – Bottom Copper](#)
 - [MTD6501D Daughter Board – Bottom Copper and Silk](#)
 - [MTD6501D Daughter Board – Bottom Silk](#)

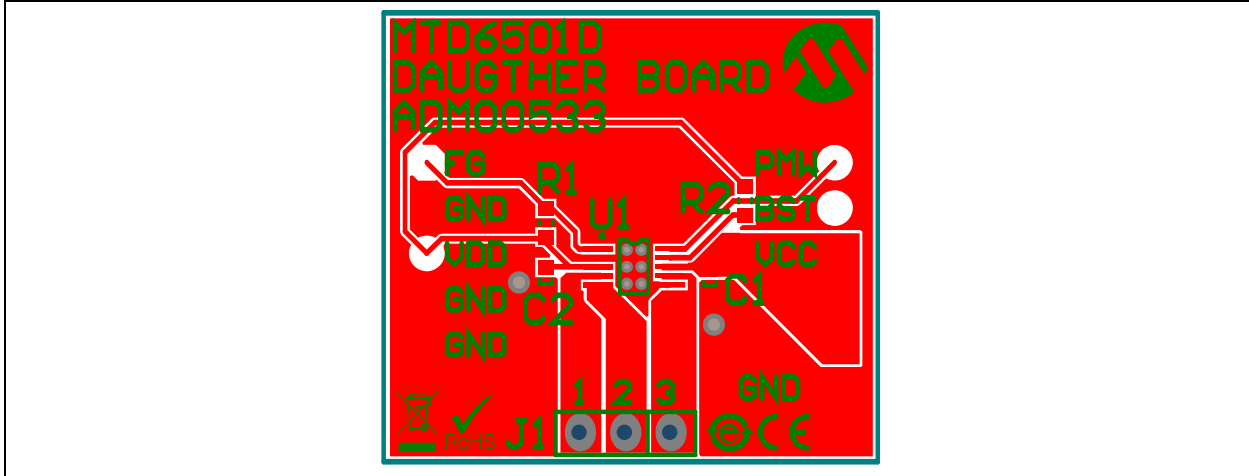
A.2 MTD6501D DAUGHTER BOARD – SCHEMATIC



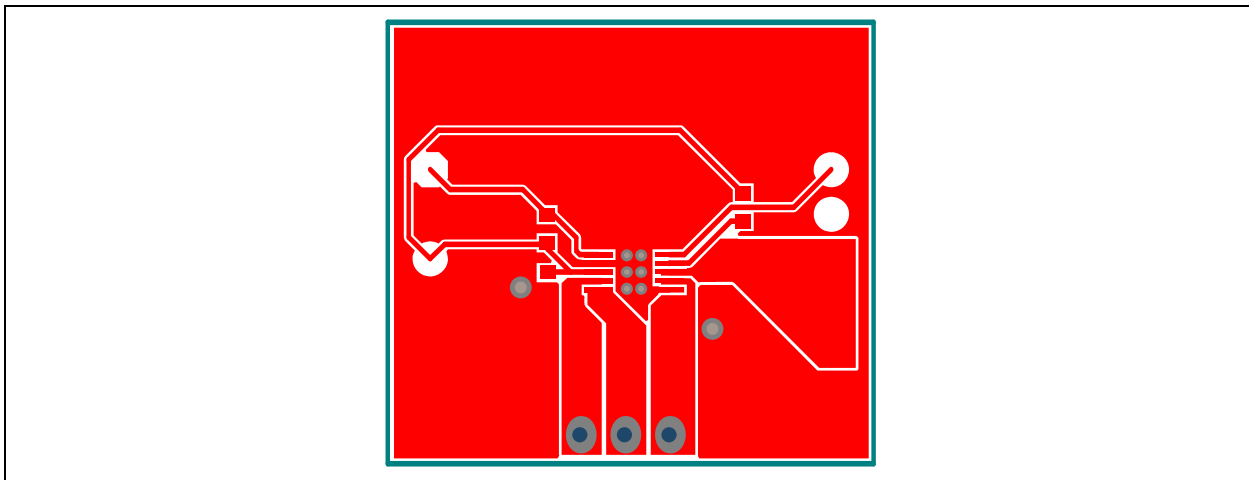
A.3 MTD6501D DAUGHTER BOARD – TOP SILK



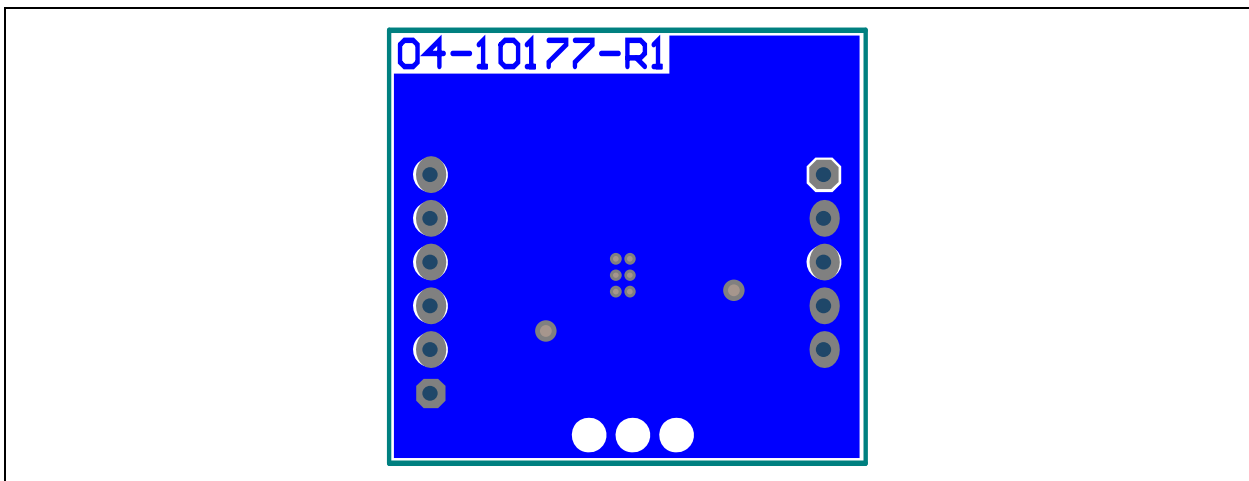
A.4 MTD6501D DAUGHTER BOARD – TOP COPPER AND SILK



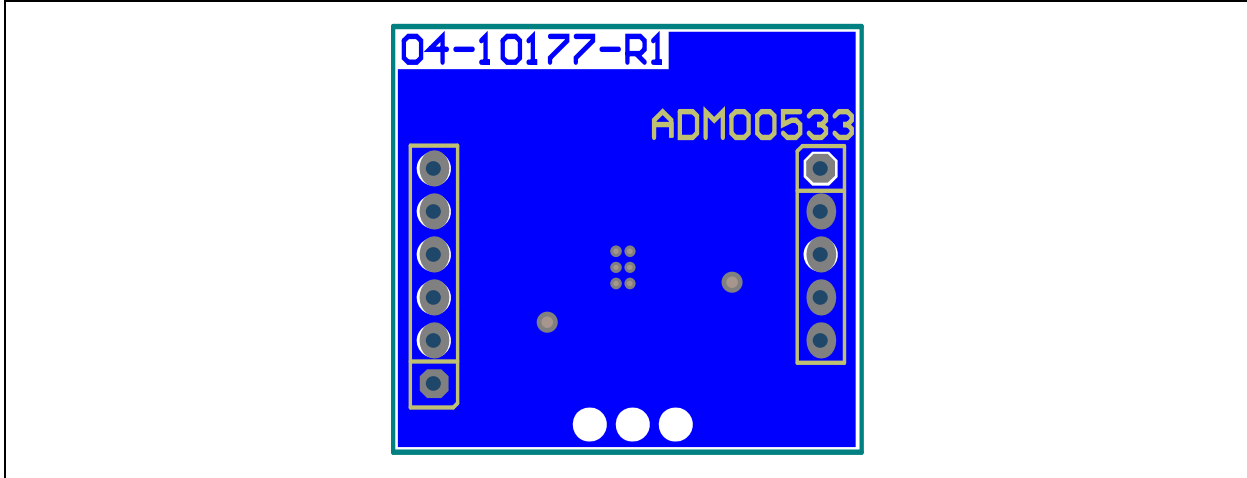
A.5 MTD6501D DAUGHTER BOARD – TOP COPPER



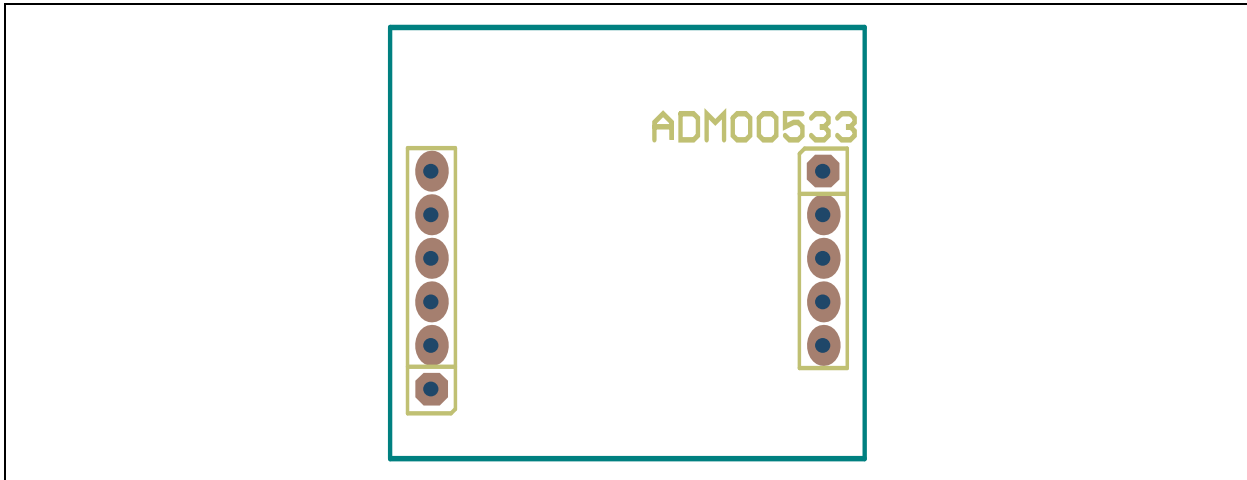
A.6 MTD6501D DAUGHTER BOARD – BOTTOM COPPER



A.7 MTD6501D DAUGHTER BOARD – BOTTOM COPPER AND SILK



A.8 MTD6501D DAUGHTER BOARD – BOTTOM SILK





**MTD6501D 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) - MTD6501D DAUGHTER BOARD (ADM00533)

Qty	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor ceramic 1 μ F 16V 10% X7R SMD 0603	Taiyo Yuden Co., Ltd.	EMK107B7105KA-T
1	C2	Capacitor ceramic 1 μ 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 [®]	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	—	04-10432
1	R1	Resistor TKF 10k 1% 1/16W SMD 0603	SPC Technology	MCHP03W8F1002T5E
1	U1	Microchip Analog Motor Driver MTD6501D-HC1 SOP-8	Microchip Technology, Inc.	MTD6501D-HC1

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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