MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board User's Guide (ADM00675)

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Object of Declaration: MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board

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VP Development Tools

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Preface

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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 MTD6501C 12V3-Phase BLDC Sensorless Fan Controller Daughter Board (ADM00675). 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 MTD6501C 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 MTD6501C 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with the MTD6501C 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix A. "Schematics and Layouts"** – Shows the schematic and layout diagrams for the MTD6501C 12V3-Phase BLDC Sensorless Fan Controller Daughter Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the MTD6501C 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
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 MTD6501C 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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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 MTD6501 device, Microchip Technology provides daughter boards for each MTD6501 device version: MTD6501D, MTD6501G and MTD6501C daughter boards.This document covers the MTD6501C Daughter Board.

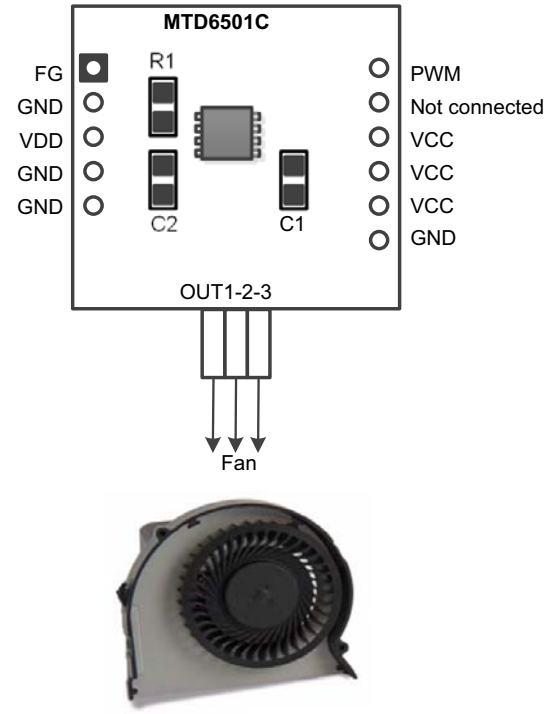
MTD6501C Daughter Board is a small board with the minimal required components to operate with the MTD6501C device.

The MTD6501C Daughter Boards have been designed to be used with the ADM00532 motherboard, but can also be used as standalone boards using their connectors.

The MTD6501C 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.

MTD6501C Daughter Board Footprints and Connections are represented in Figure 1-1.



Note 1: R1 is the FG pull-up resistor

2: C1 is the V_{DD} decoupling capacitor.

3: C2 is the V_{DD} decoupling capacitor.

FIGURE 1-1: *MTD6501C Daughter Board Footprints and Connectors.*

The board overview is represented in Figure 1-2.

FIGURE 1-2: *Existing MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board.*

For more information, see **Appendix A. "Schematics and Layouts".**

1.2 MTD6501C DAUGHTER BOARD FEATURES

The MTD6501C Daughter Board can be used as standalone board (see **Section 2.1 "Getting Started"**) but it is strongly recommended to use the MTD6501C Daughter Board with the help of the MCP8063 12V 3-Phase BLDC Sensorless Fan Controller Demonstration Board (ADM00532).

The MTD6501C 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 MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board is controlled through PC software, via a USB connection.

The MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Boards 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.

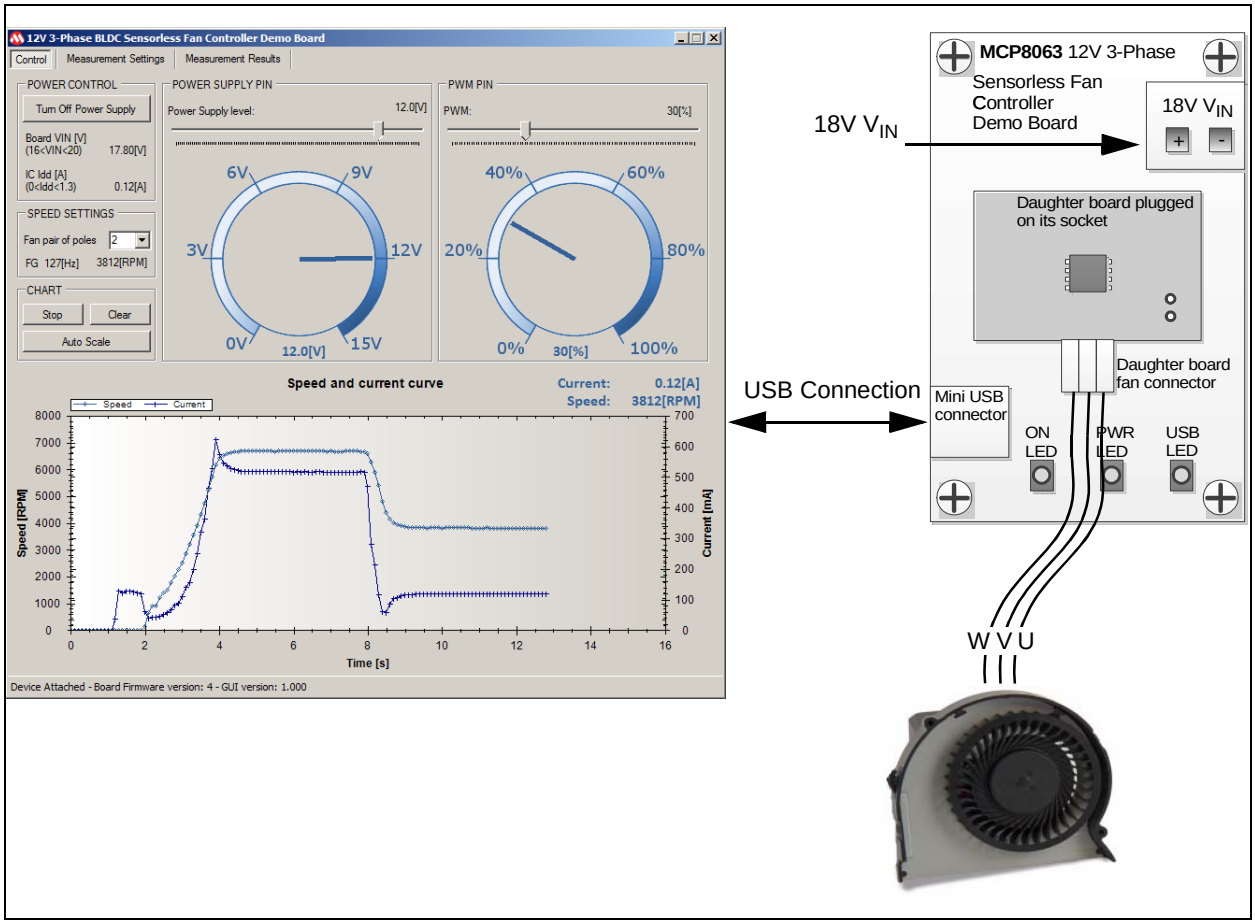


FIGURE 1-3: *System Overview*.

1.3 WHAT THE MTD6501C 12V 3-PHASE BLDC SENSORLESS FAN CONTROLLER DAUGHTER BOARD INCLUDES

Depending on the daughter board version, the MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board includes:

- MTD6501C Daughter Board (ADM00675)
- 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 to read the electrical speed of the motor. 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 MTD6501C Daughter Board.

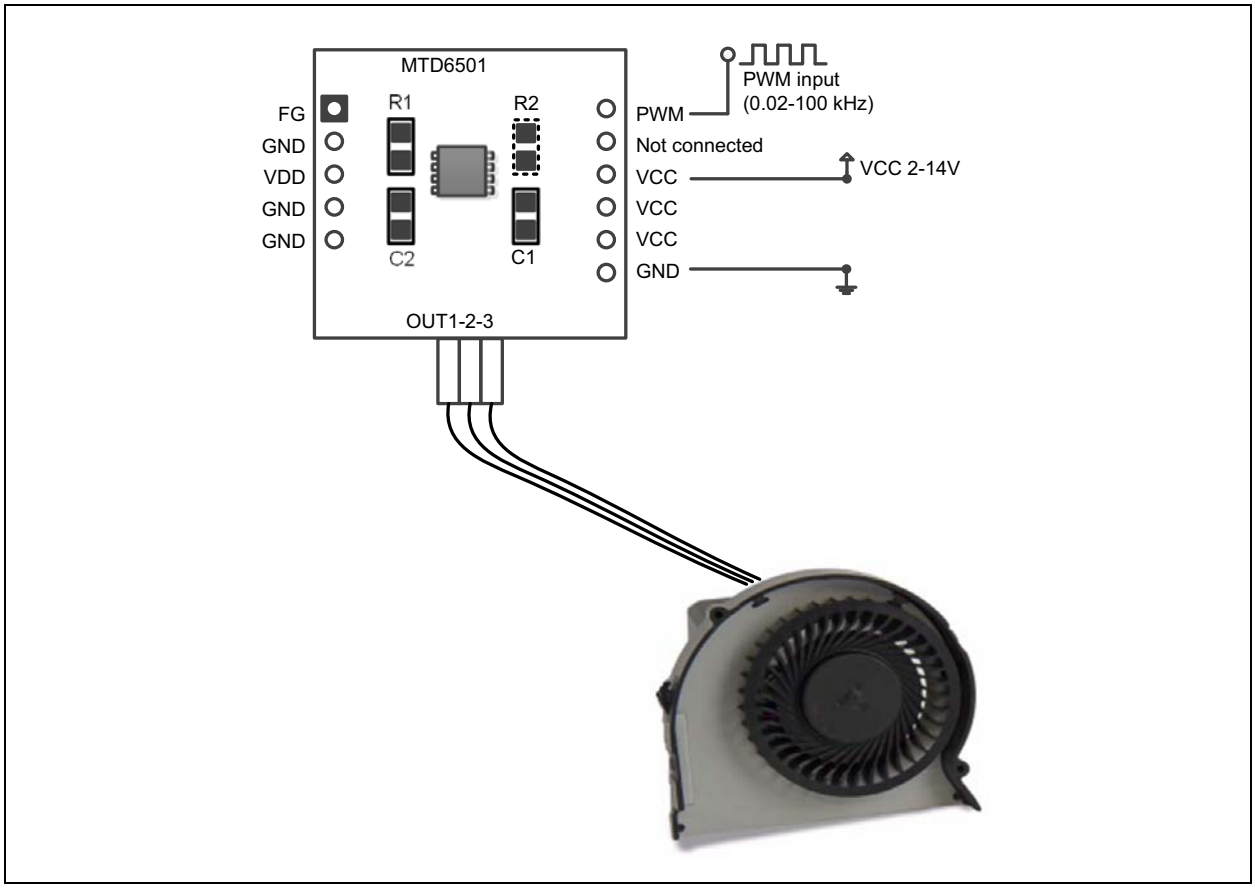


FIGURE 2-1: *MTD6501C Daughter Board Operation.*

NOTES:

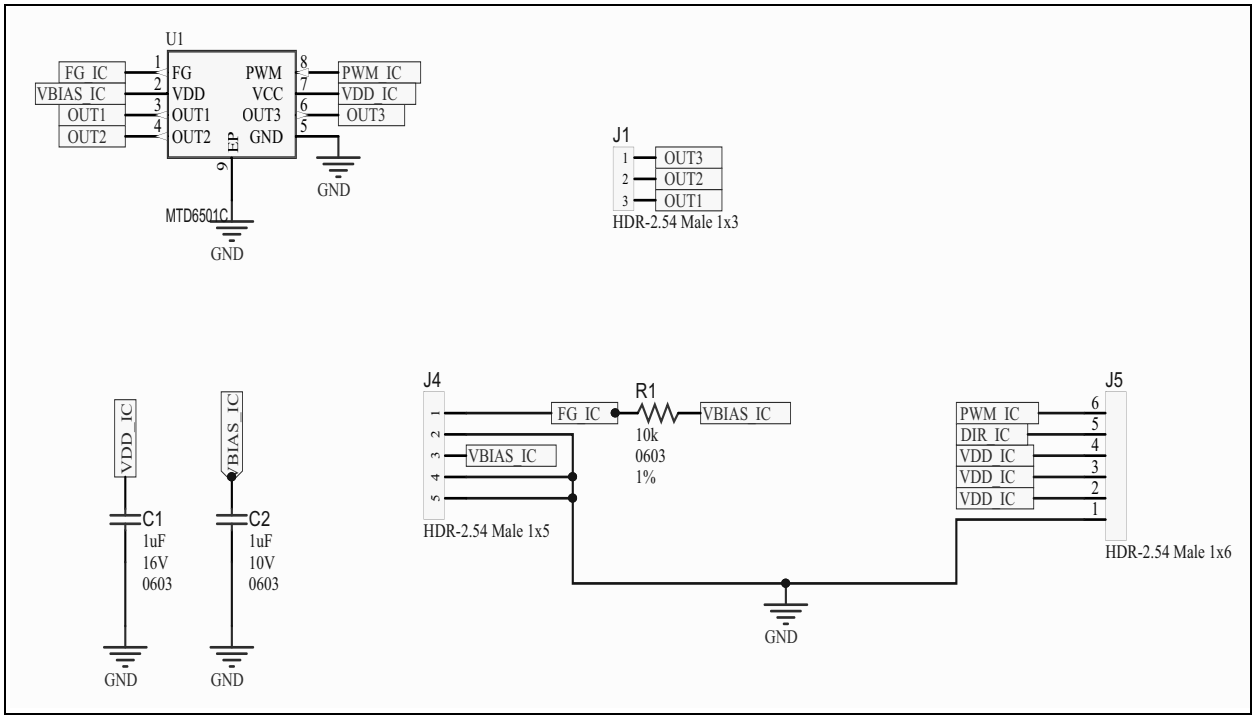
Appendix A. Schematics and Layouts

A.1 INTRODUCTION

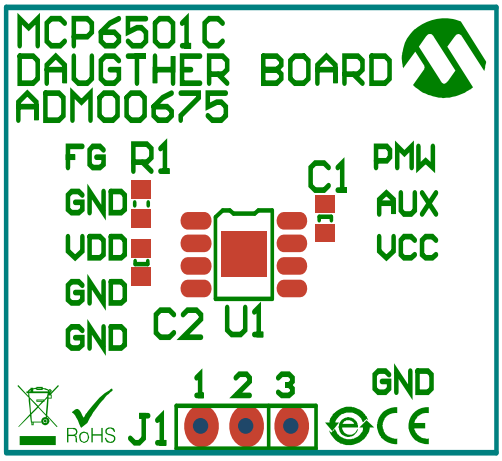
This appendix contains the schematics and layouts for the following devices which are included in the MTD6501C 12V 3-Phase BLDC Sensorless Fan Controller Daughter Board:

- **MTD6501C Daughter Board (ADM00675)**:
  - MTD6501C Daughter Board – Schematic
  - MTD6501C Daughter Board – Top Silk
  - MTD6501C Daughter Board – Top Copper and Silk
  - MTD6501C Daughter Board – Top Copper
  - MTD6501C Daughter Board – Bottom Copper
  - MTD6501C Daughter Board – Bottom Copper and Silk
  - MTD6501C Daughter Board – Bottom Silk

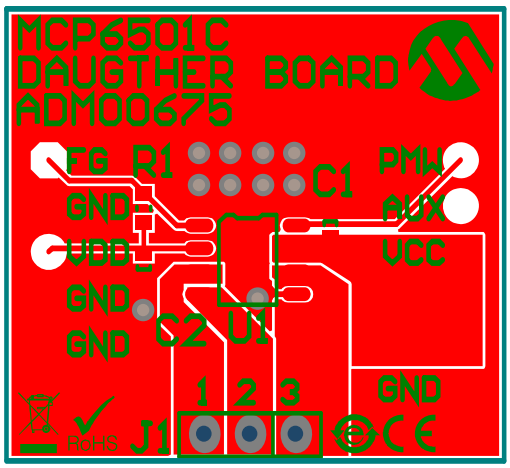
A.2 MTD6501C DAUGHTER BOARD – SCHEMATIC



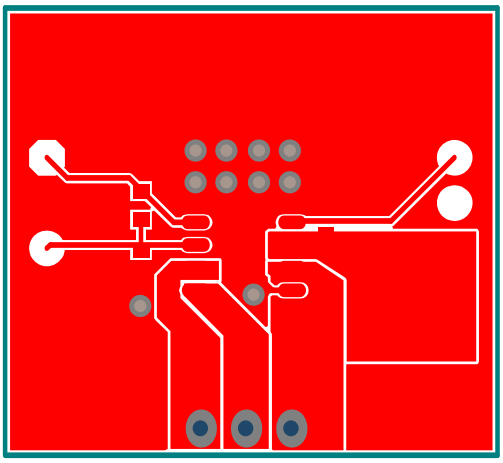
A.3 MTD6501C DAUGHTER BOARD – TOP SILK



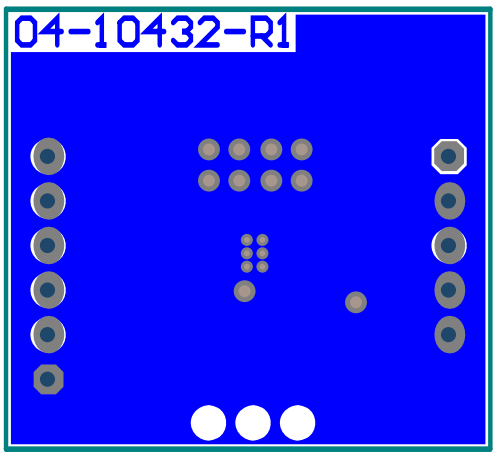
A.4 MTD6501C DAUGHTER BOARD – TOP COPPER AND SILK



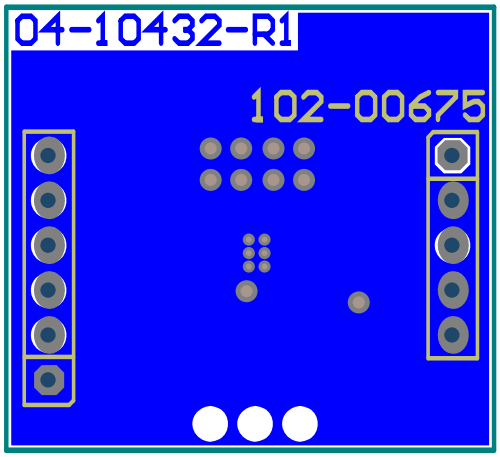
A.5 MTD6501C DAUGHTER BOARD – TOP COPPER



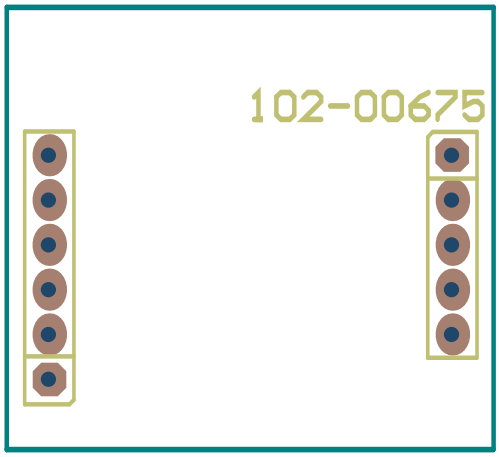
A.6 MTD6501C DAUGHTER BOARD – BOTTOM COPPER



A.7 MTD6501C DAUGHTER BOARD – BOTTOM COPPER AND SILK



A.8 MTD6501C DAUGHTER BOARD – BOTTOM SILK



Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM) - MTD6501C DAUGHTER BOARD (ADM00675)

Qty	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor ceramic 1 µF 16V 10% X7R SMD 0603	Taiyo Yuden Co., Ltd	EMK107B7105KA-T
1	C2	Capacitor ceramic 1 µF 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	—	04-10178
1	R1	Resistor TKF 10k 1% 1/16W SMD 0603	SPC Technology	MCHP03W8F1002T5E
1	U1	Microchip Analog Motor Driver MTD6501C-HC1 SOP-8	Microchip Technology, Inc	**MTD6501C-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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