CAN Bus Analyzer FD User's Guide

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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 CAN Bus Analyzer FD. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This user's guide describes how to use the CAN Bus Analyzer FD as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Introduction"**– This chapter provides a brief description of the CAN Bus Analyzer FD, highlighting its features and uses.
- **Chapter 2. "CAN Bus Analyzer FD Hardware"**– This chapter provides the hardware description of the CAN Bus Analyzer FD.
- **Chapter 3. "CAN Bus Analyzer FD Software"**– This chapter provides the software description of the CAN Bus Analyzer FD.
- **Chapter 4. "Installation"**– This chapter provides the procedures for installing the CAN Bus Analyzer FD software.
- **Appendix A. "Schematics"**– This appendix shows the CAN Bus Analyzer FD Schematics.

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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) { ... }`

RECOMMENDED READING

This user's guide describes how to use the CAN Bus Analyzer FD on a CAN network. The following Microchip documents are available on www.microchip.com and are recommended as supplemental reference resources to understand CAN (Controller Area Network) more thoroughly.

ATA6562/3, High-speed CAN FD Transceiver with Standby- and Silent Mode and WUP (DS20005790)

This data sheet provides detailed information regarding the ATA6562/3 high-speed CAN FD transceiver.

CAN Design Center

Visit the CAN design center on Microchip's website (www.microchip.com/CAN) for information on the latest product information and new application notes.

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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- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or 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://support.microchip.com.

DOCUMENT REVISION HISTORY

Revision A (June 2023)

- Initial Release of this Document.

Revision B (October 2023)

- Updated **Section 1.1 “Introduction”**.
- Updated **Section 2.2.6 “SD Card”**, **Section 2.2.7 “mikroBUS™ Add-On Board Support”**, **Section 2.2.9 “Trigger”**.
- Updated **Section 3.2 “Software Features”**.
- Updated **Section 4.1 “Introduction”**.
- Updated **Section 4.2.1 “Set up Wireshark to Work with APGDT006 Hardware”**.
- Updated **Section 4.2.2 “Set up Other Software to Work with APGDT006 Hardware”**.
- Added **Section 4.2.3 “Installing the APGDT006 Driver”**.
- Updated Table 2-2.

Chapter 1. Introduction

1.1 INTRODUCTION

The CAN Bus Analyzer FD (CBA-FD) development tool is intended to be a simple-to-use, low-cost CAN-FD Bus monitor which can be used to develop and debug CAN Flexible Data Rate (CAN FD) networks. The tool features a broad range of functions which allow it to be used across various market segments including automotive, marine, industrial and medical.

The CBA-FD is fully compliant with ISO 11898-1:2015 and ISO 11898-2:2016. When the CAN Bus Analyzer FD is used with Wireshark, it has the functionality of capturing, filtering, and saving traffic from a CAN-FD network.

The chapter covers the following topics:

- CAN Bus Analyzer FD Kit Contents
- CAN Bus Analyzer FD System Block Diagram

1.2 CAN BUS ANALYZER FD KIT CONTENTS

The CAN Bus Analyzer FD Kit contains the following:

- CAN Bus Analyzer FD Development Tool
- USB-A to USB-Mini Cable for Connection to the PC

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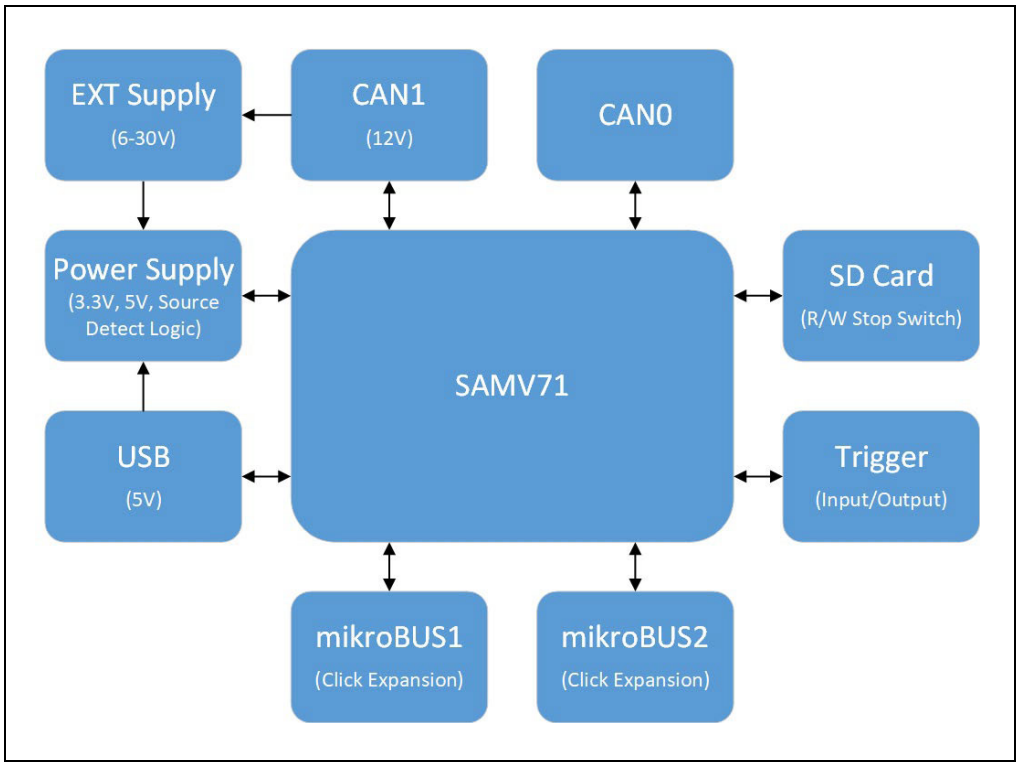
1.3 SYSTEM BLOCK DIAGRAM

FIGURE 1-1: CAN BUS ANALYZER FD SYSTEM BLOCK DIAGRAM



1.4 CAN BUS ANALYZER FD OVERVIEW

The CAN Bus Analyzer FD provides similar features available in a high-end CAN network analyzer tool at a fraction of the cost. The CBA-FD tool can be used to monitor and debug a CAN network with an easy-to-use graphical user interface. The tool allows the user to view and log received and transmitted messages from the CAN Bus. The user is also able to transmit single or periodic CAN messages onto a CAN Bus, which is useful during development or testing of a CAN network.

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Chapter 2. CAN Bus Analyzer FD Hardware

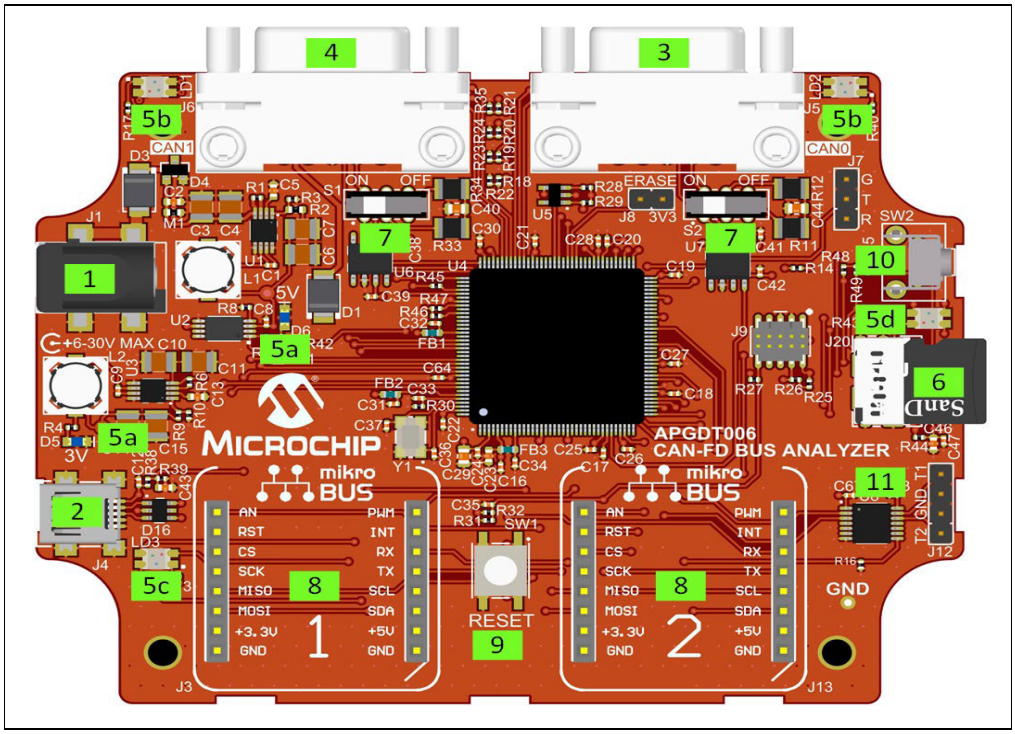
2.1 INTRODUCTION

This chapter contains descriptions of the CAN Bus Analyzer FD hardware features.

2.2 HARDWARE FEATURES

The CAN Bus Analyzer FD is a compact, fully featured CAN Bus tool. A layout of the tool is shown in Figure 2-1 that illustrates its hardware key features.

FIGURE 2-1: CAN BUS ANALYZER FD



1. 6V-30V External Power Supply Connector
2. Mini-USB Connector
3. CAN0 DB9 Connector
4. CAN1 DB9 Connector
5. Indicator LEDs
   - 5a. 3.3V and 5V power
   - 5b. CAN0 and CAN1 status
   - 5c. USB status
   - 5d. SD Card status

6. SD Card Slot
7. CAN0/CAN1 Bus Termination Switches
8. mikroBUS™ Click Interface (x2)
9. MCU RESET Switch
10. SD Card Stop Switch
11. Trigger Input/Output Header

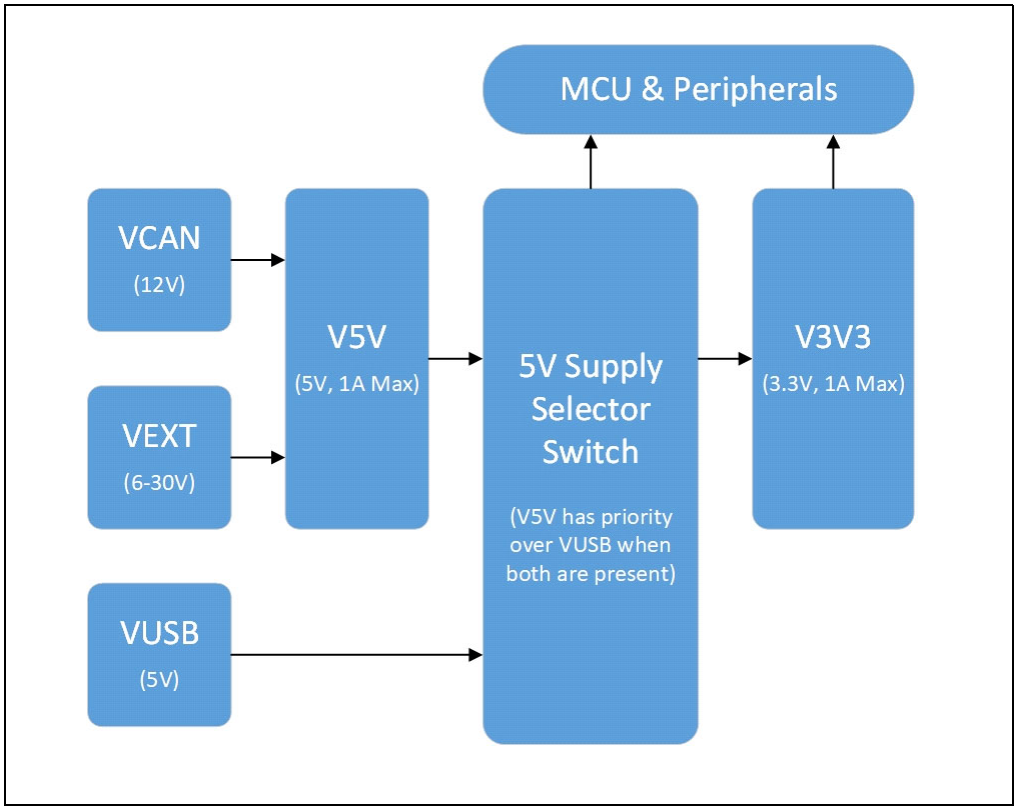
2.2.1 Power Supply

The CBA-FD can be powered by:

1. VEXT – external power supply, 6V-30V Max, power jack, J1.
2. VUSB – USB bus power, 5V, USB Mini-B connector, J4.
3. VCAN – CAN power, 6V-30V, DB9 connector, J6.

Note: VCAN is only available from the CAN1, J6, connector. 12V supply only, 5V is not supported. CAN0, J5, does not contain a CAN power output.

FIGURE 2-2: POWER SUPPLY BLOCK DIAGRAM



The VEXT and VCAN supplies are isolated from one another using blocking diodes. Both of these supplies feed the on-board 5V regulator, V5V. The 3.3V regulator, V3V3, can be supplied by either V5V or VUSB. Both the 5V and 3.3V regulators use the Microchip MCP16312-E/MS. Refer to www.microchip.com for further details concerning this device.

A digital supply switch has been included to prioritize the main 5V supply source in the event that both the on-board regulated V5V supply (VEXT or VCAN) and the VUSB supplies are present. In this instance, V5V receives priority and the 3.3V supply, V3V3,

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will be provided by the on-board 5V regulator, V5V, not VUSB. The 5V supply provided by the USB connector will only be used in the instance when no other supply is present on the board.

TABLE 2-1: 5V SUPPLY SELECTOR OUTPUT

5V Supply Selector	
Input(s)	Switched Output
V5V & VUSB	V5V
V5V	V5V
VUSB	VUSB

2.2.2 Processor Support

The CBA-FD utilizes the Microchip ATSAMV71Q21B as the core microcontroller for the development tool. Support for this MCU is available using Microchip MPLAB® X IDE, v5.30 and later, and MPLAB IPE, v5.30 or later. The header, J9, acts as a dedicated SWD programming interface to the MCU and the push button switch, SW1, provides a method to manually reset the MCU, if necessary. Refer to www.microchip.com for further details concerning this device.

2.2.3 CAN Transceiver

CAN0 and CAN1 on the CBA-FD both use the Microchip ATA6563 high-speed CAN transceiver. Refer to www.microchip.com for further details concerning this device.

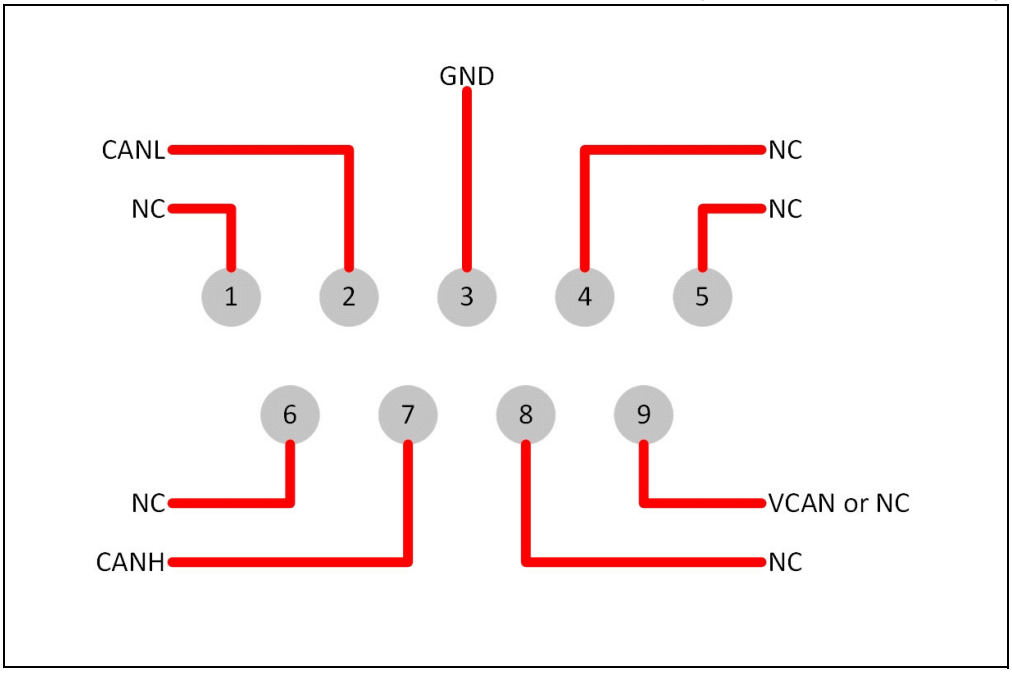
2.2.4 USB Interface

The CBA-FD contains a USB interface, J4 (USB Mini-B), which serves as a communication medium to the PC. It also functions as an alternate 5V power supply source, VUSB, in the instance where the V5V supply is not present.

2.2.5 DB9 CAN Connectors

CBA-FD CAN Bus connections for CAN0 and CAN1. Figure 2-3 shows the standard automotive interconnect.

FIGURE 2-3: CBA-FD CAN BUS WIRING DIAGRAM (DB-9 MALE, TOOL-SIDE)



VCAN is an optional power supply pin and can be left as NC ("No Connect") if the CAN Bus power supply is not required.

The CAN Bus termination resistors on both CAN0 and CAN1 can be manually switch ON and OFF using S1 (CAN1) and S2 (CAN0).

2.2.6 SD Card

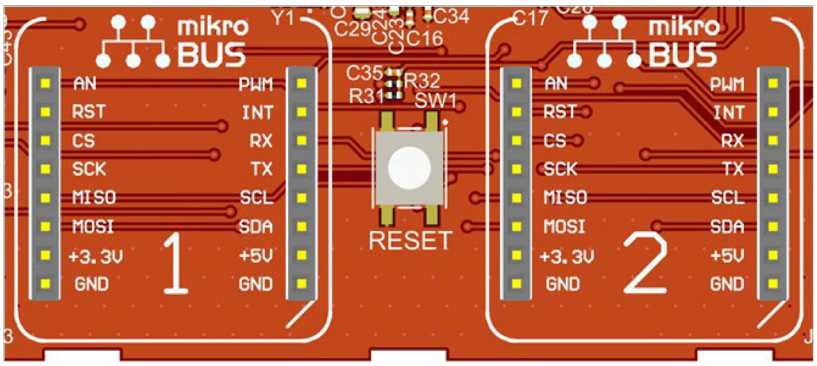
This hardware is not supported when using Wireshark.

Refer to the wiki https://github.com/MicrochipTech/CBA-FD for further details.

2.2.7 mikroBUS™ Add-On Board Support

The CBA-FD supports the mikroBUS™ add-on board standard developed by Mikro-Elektronica. The CBA-FD contains two add-on sockets labeled "1" and "2".

Figure 2-4: mikroBUS™ ADD-ON BOARD SOCKETS



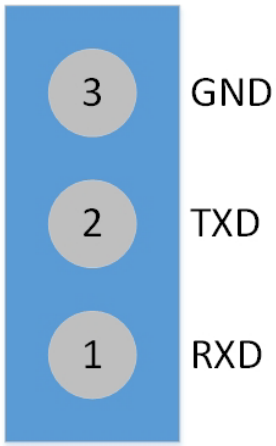
This hardware is not supported when using Wireshark.

Refer to the wiki https://github.com/MicrochipTech/CBA-FD for further details.

2.2.8 UART Header

The breakout header, J7, can be used as an external UART connection. The pinout is shown in Figure 2-5.

FIGURE 2-5: CBA-FD UART PINOUT



Refer to the wiki https://github.com/MicrochipTech/CBA-FD for further details.

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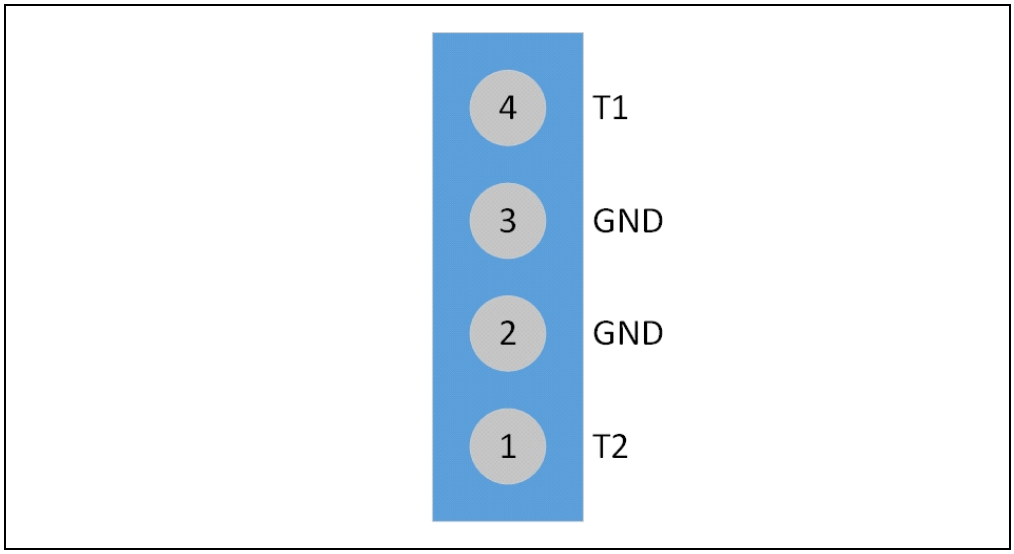
2.2.9 Trigger

The breakout header, J12, is the trigger circuit in/out. Two trigger pins, T1 and T2, have been included. The trigger header pinout is shown in Figure 2-6.

FIGURE 2-6: TRIGGER PINOUT



This hardware is not supported when using Wireshark.

Refer to the wiki https://github.com/MicrochipTech/CBA-FD for further details.

2.2.10 LED Status Indicators

The CBA-FD contains several indicator LEDs to denote hardware status as outlined in Table 2-2.

TABLE 2-2: LED STATUS INDICATORS (*When using the Wireshark*)

Indicator	Ref. Designator	Function			
		Red	Green	Blue	OFF
3.3V	D5	N/A	N/A	Power On	No power/ Power fail
5V	D6	N/A	N/A	Power On	No power/ Power fail
CAN0 (Note 1)	LD2	Error	Data	Initialized/Idle	Not initialized
CAN1 (Note 2)	LD1	Error	Data	Initialized/Idle	Not initialized
USB (Note 3)	LD3	Error	Data	Driver installed	No driver installed/ Device disabled
SD Card (Note 4)	LD4	Error	Data	N/A	No card present/ Not supported

Note 1: When the user configures CAN module 0, LD2 will flash green.

2: When the user configures CAN module 1, LD1 will flash green.

3: The twinkle feature is used to identify a certain board via software. This is useful if there are many boards connected to the same machine. If a twinkle is requested via software, LD3 will flash red for about 3 seconds then turns off.

4: SD Card feature is not accessible when using Wireshark.

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Chapter 3. CAN Bus Analyzer FD Software

3.1 INTRODUCTION

This chapter contains the CAN Bus Analyzer FD software features.

3.2 SOFTWARE FEATURES

A library is provided with the CAN BUS Analyzer FD hardware that allows connection to various programming languages and tools.

For example, it can be used with Wireshark which will allow the user to receive CAN and CAN-FD messages.

For more information on the Wireshark software, visit https://www.wireshark.org/.

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Chapter 4. Installation

4.1 INTRODUCTION

This chapter contains the procedures for installing software that can be used with the CAN Bus Analyzer FD (APGDT006) hardware.

4.2 SOFTWARE INSTALLATION

4.2.1 Set up Wireshark to Work with APGDT006 Hardware

1. Download Wireshark from https://www.wireshark.org/.
2. Download the APGDT006 " extcap file zip" from www.microchip.com/apgdt006.
3. Unzip and copy the APGDT006 "extcap files" to the Wireshark extcap folder found in the Wireshark install folder location.

FIGURE 4-1: WIRESHARK INSTALL FOLDER LOCATION

4. Install the APGDT006 driver.

4.2.2 Set up Other Software to Work with APGDT006 Hardware

Refer to wiki https://github.com/MicrochipTech/CBA-FD for more details on how to set up other software to work with the CAN BUS Analyzer FD (APGDT006).

4.2.3 Installing the APGDT006 Driver

Refer to wiki https://github.com/MicrochipTech/CBA-FD for more details on the driver or to download the driver directly.

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Appendix A. Schematics

A.1 INTRODUCTION

This chapter contains the technical information of the CAN Bus Analyzer FD.

A.2 CAN BUS ANALYZER FD SCHEMATICS

FIGURE A-1: TOP LEVEL

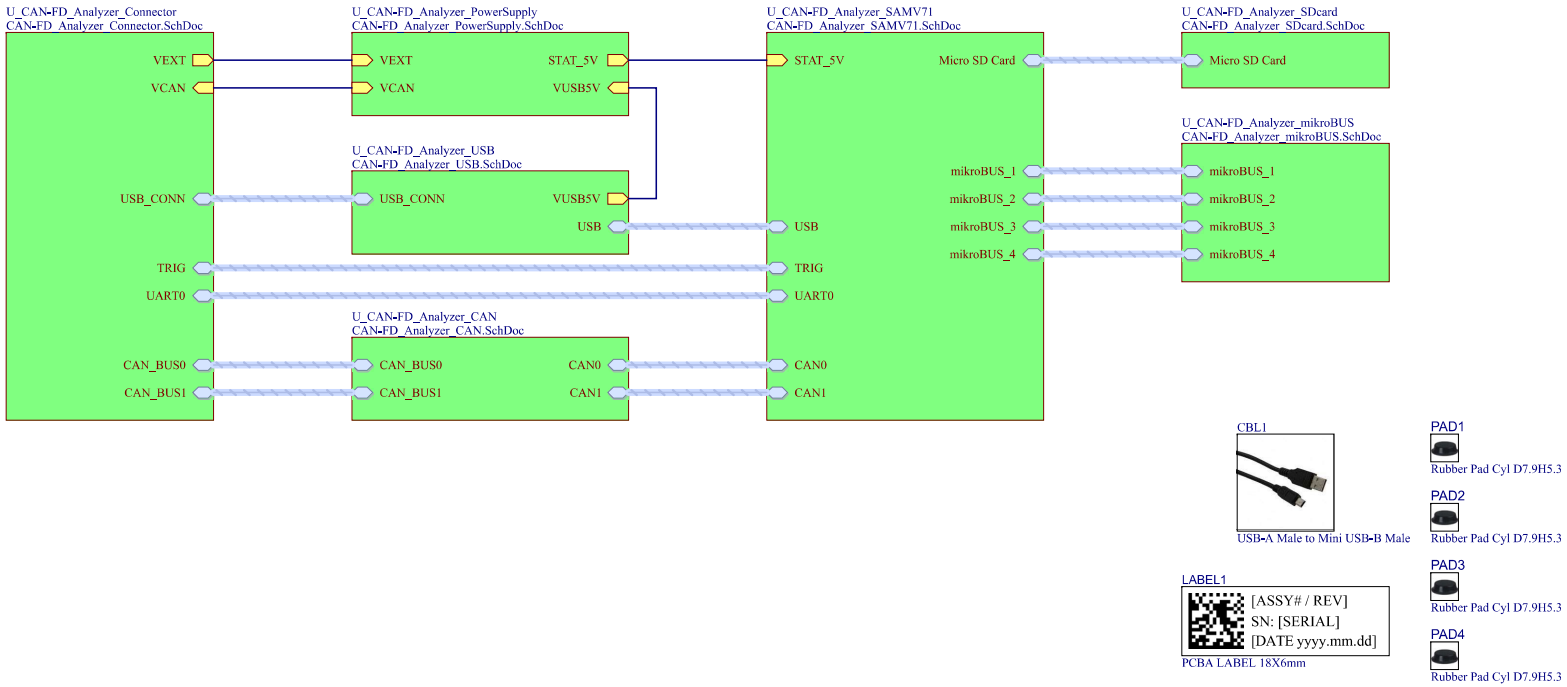

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FIGURE A-2: CONNECTORS AND HEADERS

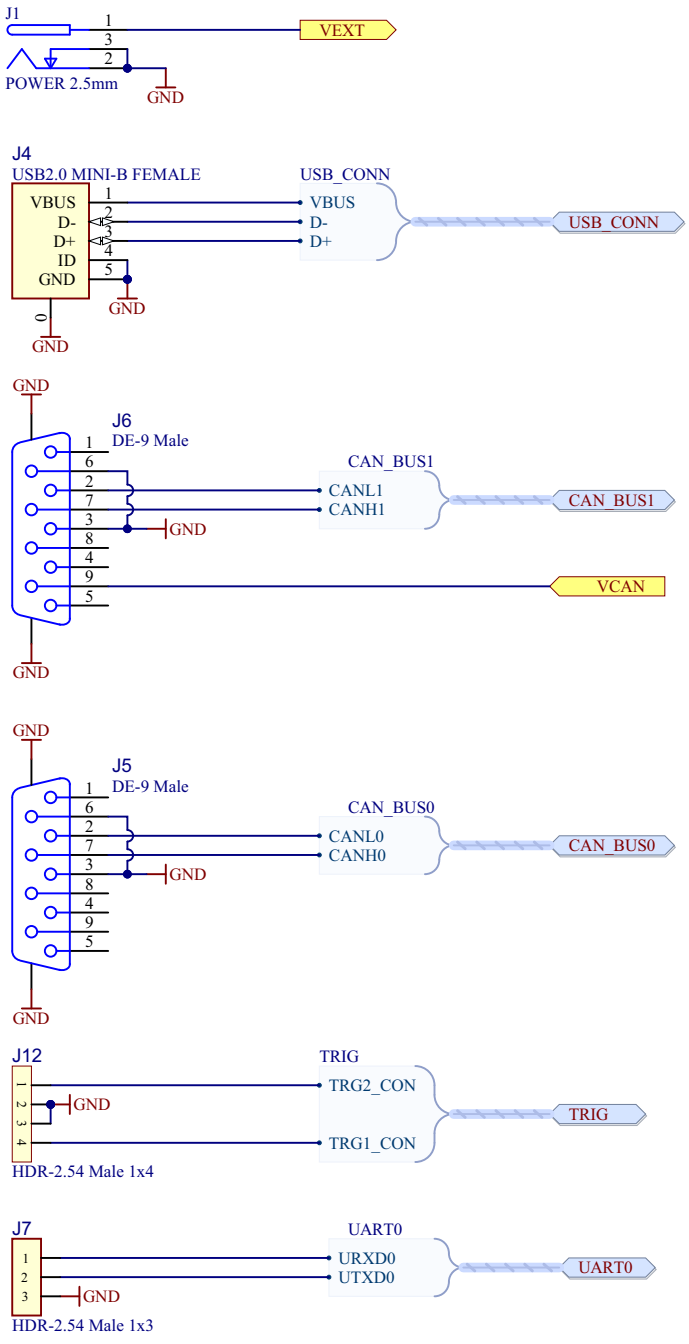

FIGURE A-3: POWER SUPPLY

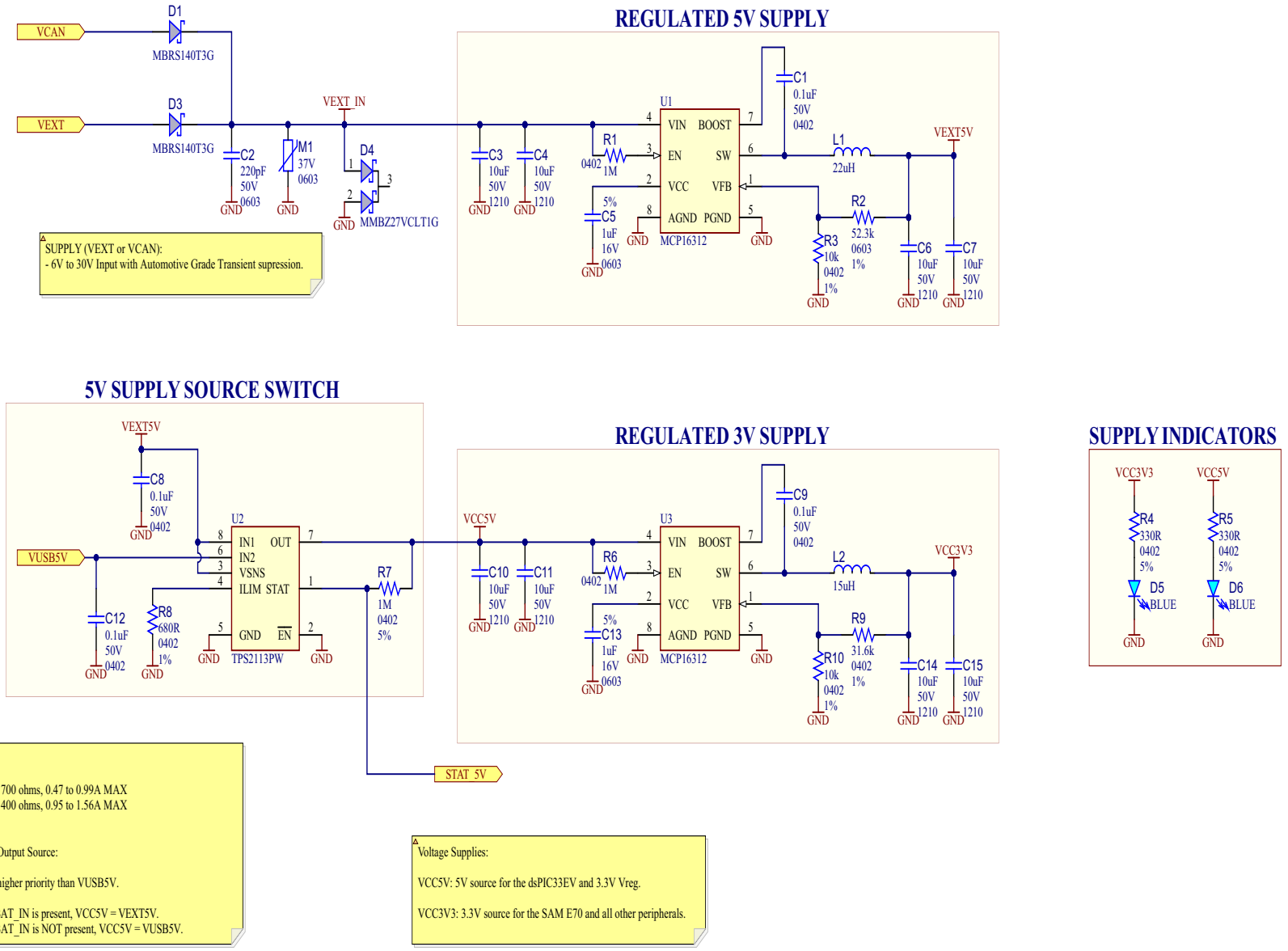

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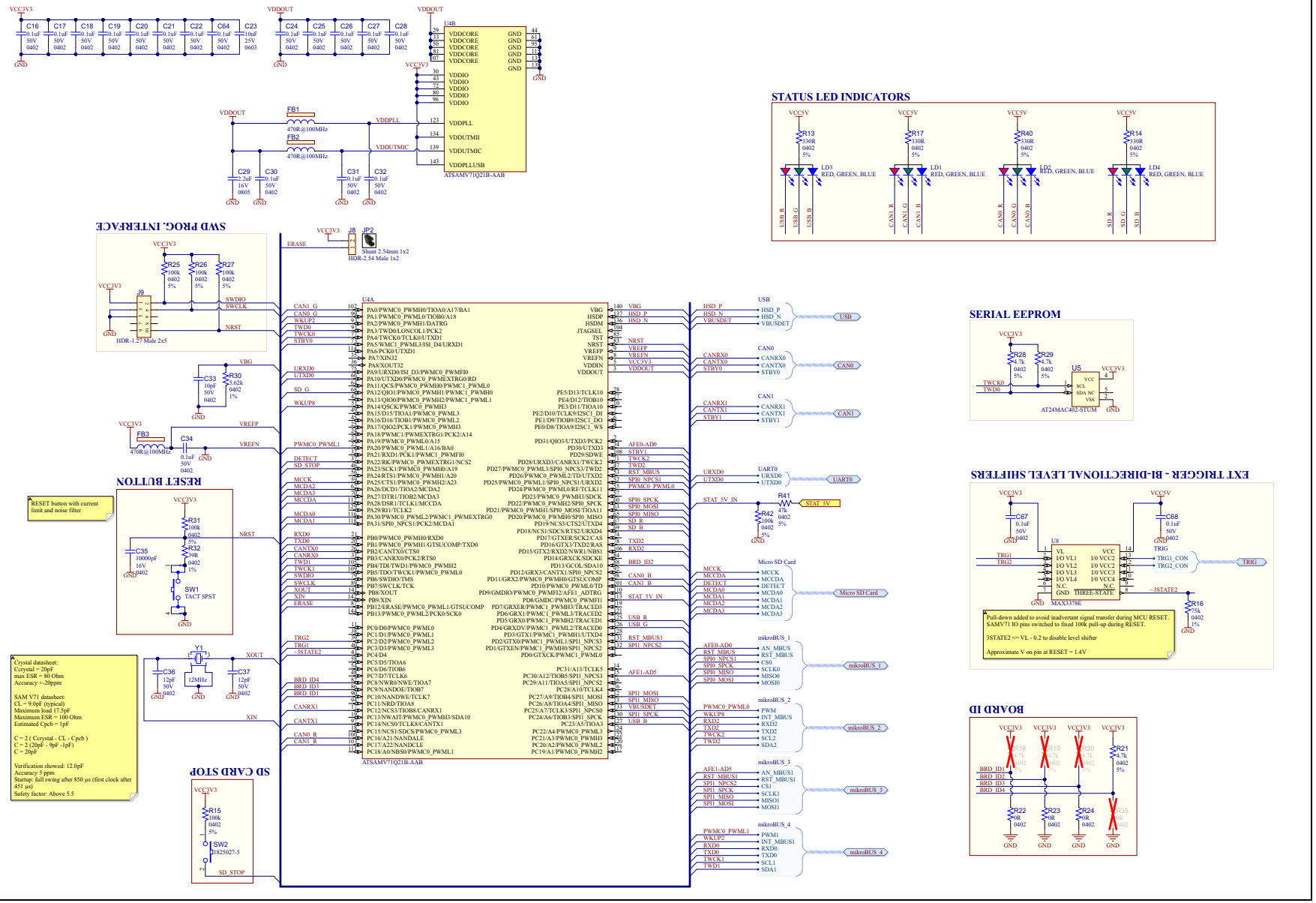
FIGURE A-4: SAMV71 TARGET MCU



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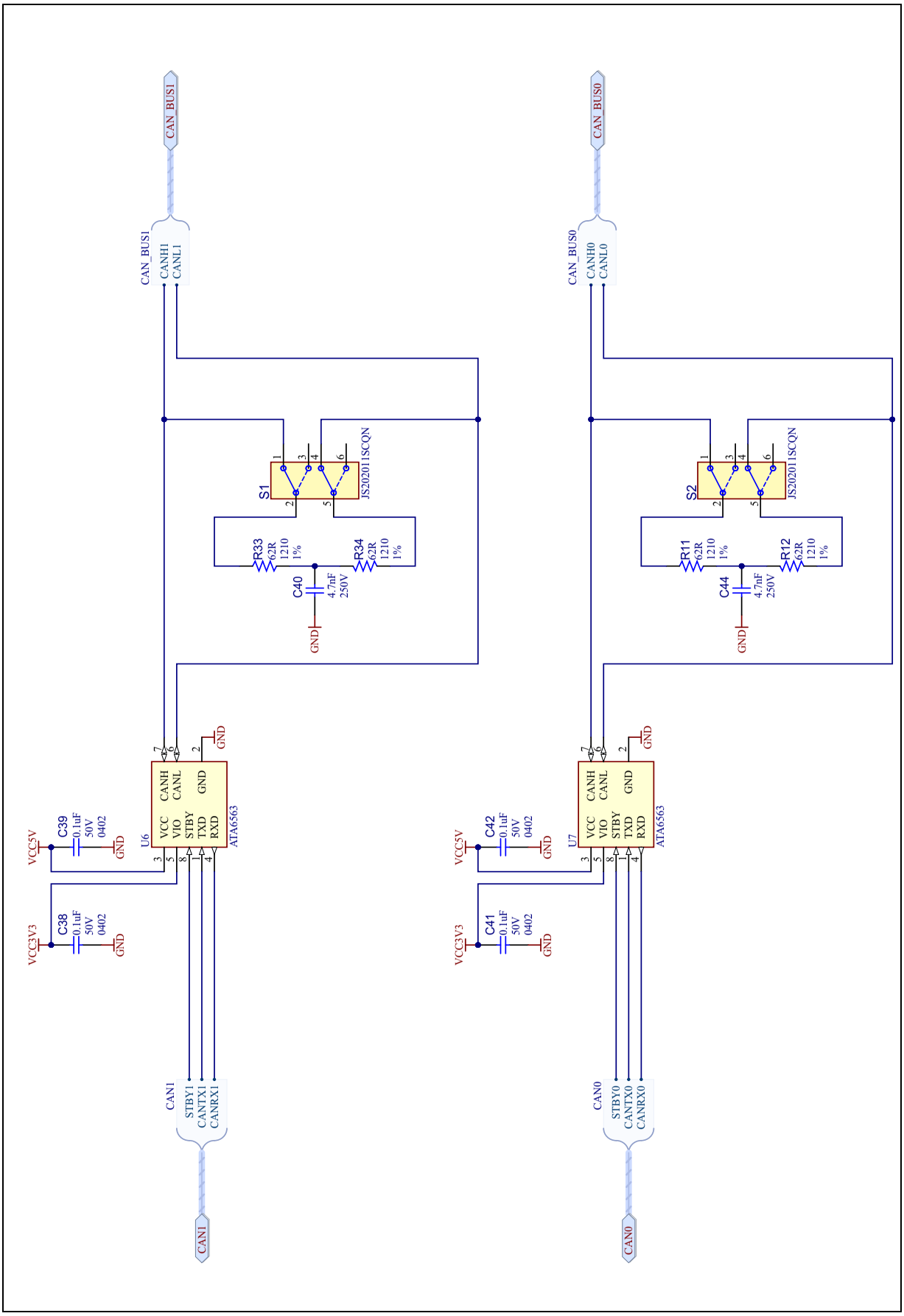

FIGURE A-5: CAN INTERFACE

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FIGURE A-6: CONNECTOR

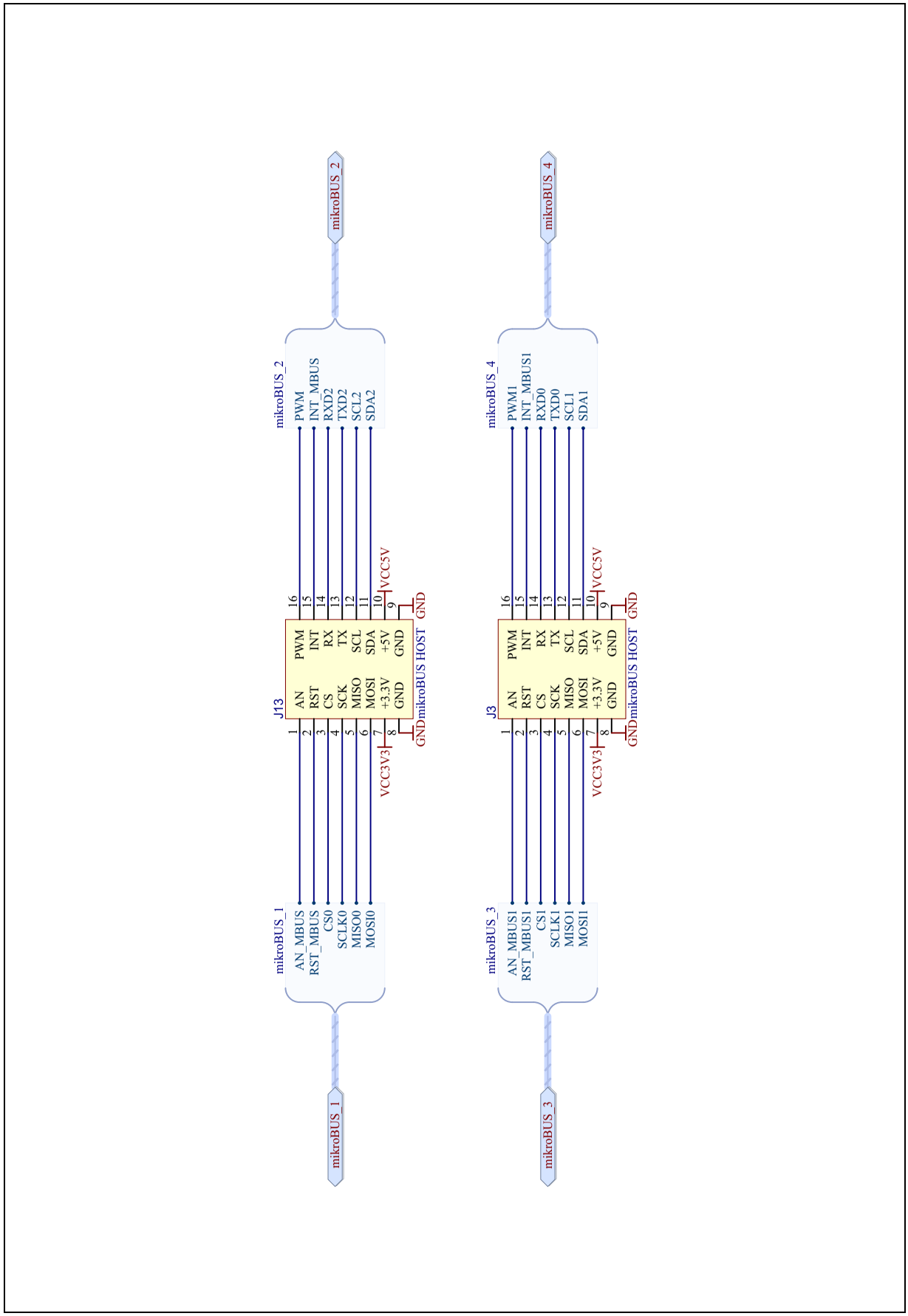

FIGURE A-7: USB

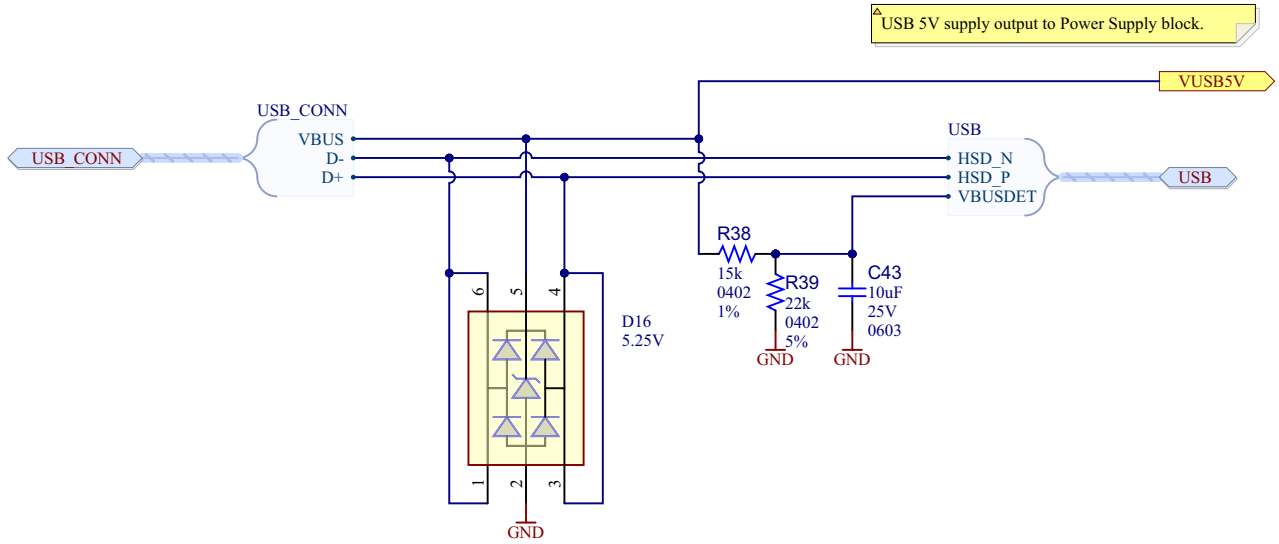

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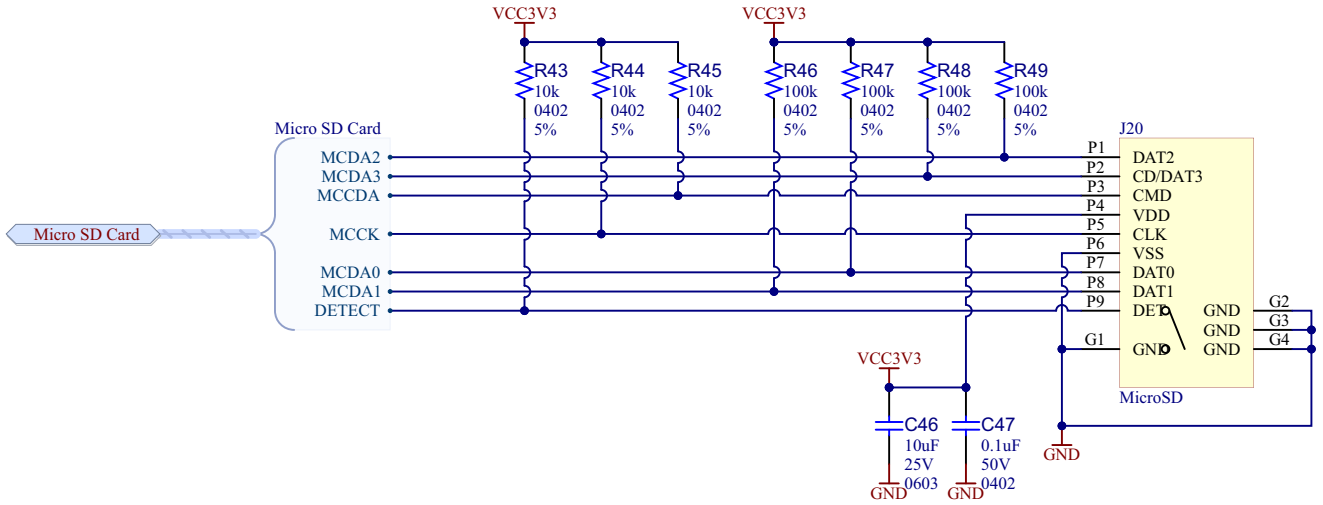
FIGURE A-8: SD CARD



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