

# MCU-430F5438A-MVK MAVRK Module

## Technical Reference Manual



Literature Number: SLAU379  
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<b>1</b>	<b>Purpose of this document</b>	<b>5</b>
<b>2</b>	<b>EVM Overview</b>	<b>5</b>
2.1	EVM Description	6
2.2	Highlighted Products	7
2.3	Block Diagram	7
2.4	EVM Wiki	7
2.5	EVM Landing Page	8
<b>3</b>	<b>Hardware Description</b>	<b>8</b>
3.1	Power Requirements	8
3.2	Connector Signal Description	8
3.3	Getting Started: Configuring the EVM	8
3.4	EVM Test Points	8
3.5	<b>EVM LEDs</b>	<b>10</b>
3.5.1	RED LED	10
3.5.2	GREEN LED	10
3.5.3	YELLOW LEDs	10
<b>4</b>	<b>Software Description</b>	<b>12</b>
4.1	MAVRK Software Minimum Requirements	12
4.2	How to get the MAVRK Software	12
4.3	Where do I find the MAVRK Qt Demo Application?	12
4.4	Where do I find the Demo and Test Code?	12
<b>5</b>	<b>Board Files</b>	<b>12</b>
5.1	Bill of Materials (BOM)	12
5.2	Layout (PDF)	13
5.3	Schematics (PDF)	13
5.4	Fabrication Drawings (PDF)	14
5.5	Request Gerber and Schematic files	14
<b>6</b>	<b>MAVRK Links</b>	<b>14</b>
6.1	I want more info on MAVRK	14
6.2	I have MAVRK Questions	14
6.3	I want more Technical Info on MAVRK Hardware	14
6.4	I want more Technical Info on MAVRK Software	15
6.5	I want to get a MAVRK board	15
<b>7</b>	<b>Important Notices</b>	<b>15</b>
7.1	ESD Precautions	15
7.2	Certifications	15
7.3	Evaluation Board/Kit Important Notice	16
7.4	FCC Warning	16
7.5	EVM Warnings and Restrictions	16



## **MCU-430F5438A-MVK MAVRK Module**

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### **1 Purpose of this document**

This document covers the details of the Modular and Versatile Reference Kit (MAVRK) MCU-430F5438A-MVK module. A developer should understand the features of the MCU-430F5438A-MVK module after reading this guide. These features include the module's analog inputs; its connections to protocols like I2C, SPI, GPIO, and UART; and its role as a controller for all other MAVRK modules on the [MAVRK Motherboard](#). This page will explain the best practices for configuring the MCU-430F5438A-MVK module, connecting the module to the [MAVRK Pro Motherboard](#), and getting compiled code onto the module. This page will also include the hardware files for the MCU-430F5438A-MVK module.

### **2 EVM Overview**

This section contains general information pertinent to this module.

## 2.1 EVM Description

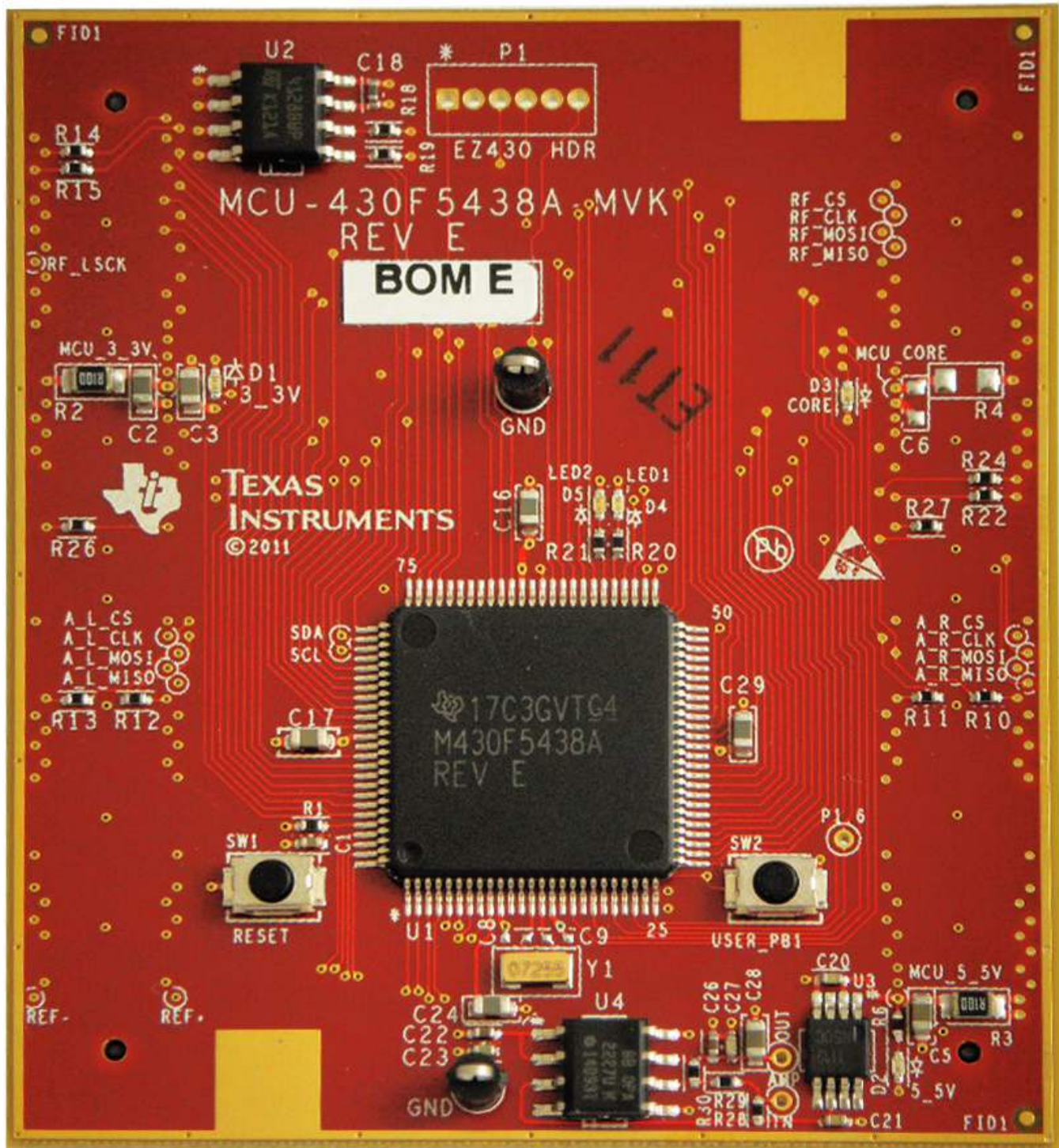


Figure 1.

The MCU-430F5438A-MVK processor is a MAVRK module for the [MSP430F5438A](#), an ultra low power mixed signal microcontroller. The device features three 16-bit timers, a high performance 12-bit analog-to-digital converter, up to four universal serial communication interfaces (USCI), hardware multiplier, direct memory access (DMA), a real-time clock module with alarm capabilities, and up to 87 I/O pins. The MSP430F5438A microcontroller has a 25MHz CPU speed with 256k Flash and 16k RAM.

The MCU-430F5438A-MVK module uses the MSP430F5438A to demonstrate functionality for fast system evaluation and prototyping. It plugs into an MCU slot on a suitable [MAVRK Motherboard](#) such as the [MB-PRO-MVK](#). It uses the MCU slot in the MAVRK motherboard to connect the I2C, SPI, GPIO, and UART busses as well as receive power from the motherboard. The module's analog inputs provide a simple approach to sampling sensor inputs or other low frequency signals.

For a more general description of MAVRK MCU modules, please see the [Hardware Design Guide for MAVRK MCU Modules](#) wiki page.

## 2.2 Highlighted Products

The MCU-430F5438A-MVK module features the following devices:

- [MSP430F5438 16-Bit Ultra-Low-Power Microcontroller, 256KB Flash, 16KB RAM, 12 Bit ADC, 4 USCIs, 32-bit HW Multi](#)
- [REF5030A Low Noise, Very Low Drift, Precision Voltage Reference](#)

## 2.3 Block Diagram

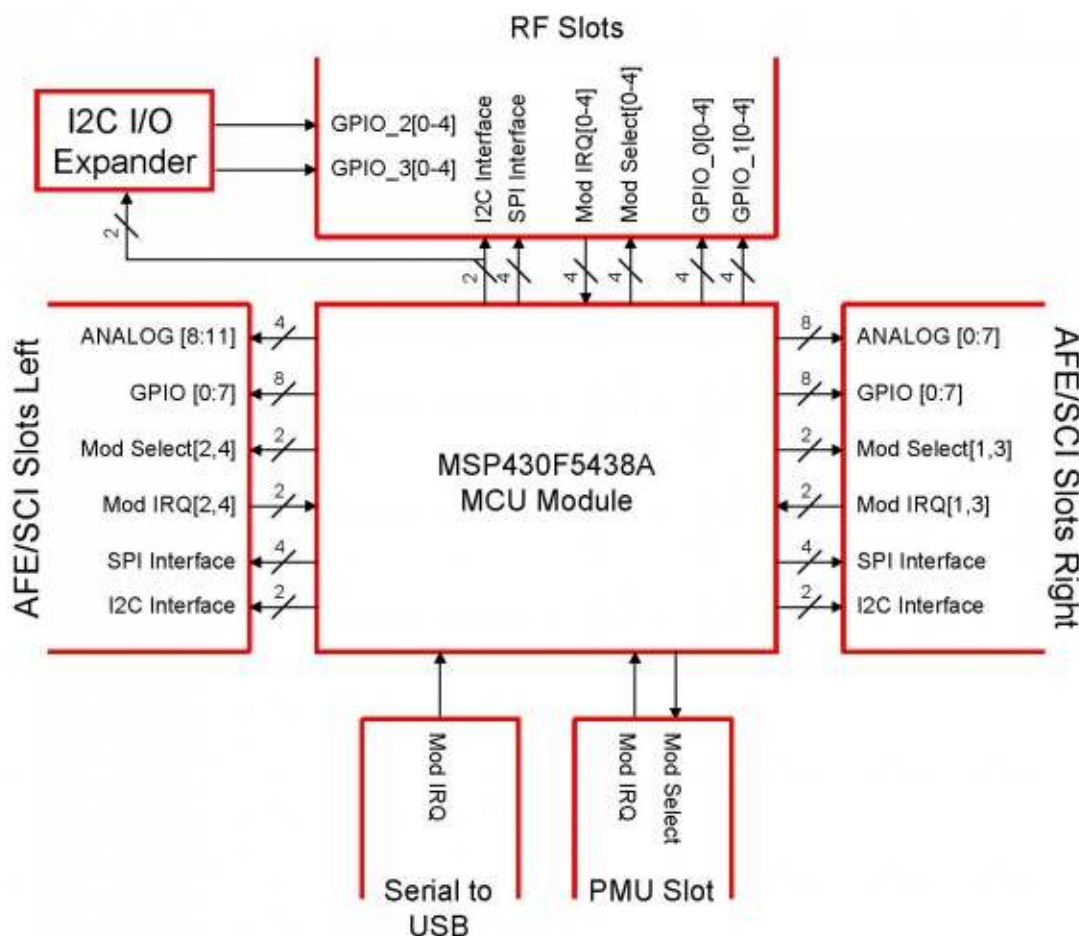


Figure 2.

- Note: GPIO, SPI and I2C are common to both Right and Left sides.

## 2.4 EVM Wiki

[\[MCU-430F5438A-MVK MAVRK Module Wiki\]](#)



## 2.5 EVM Landing Page

[MAVRK MSP430F5438A MCU Product Folder](#)

## 3 Hardware Description

### 3.1 Power Requirements

The MCU-430F5438A-MVK requires and receives power from the [MAVRK Motherboard](#). The motherboard provides the following supplies to the MCU:

- DVDD\_3\_3V: 3.3 volt digital supply, 35mA.
- AVDD\_5\_5V: 5.5 volt analog supply, 25mA.

### 3.2 Connector Signal Description

For a detailed connector pinout information follow this link to [MCU Pinout for MAVRK](#).

### 3.3 Getting Started: Configuring the EVM

For the MAVRK MCU-430F5438A-MVK to function you will need to couple it with at least a [MAVRK Motherboard](#) and debugger. The MCU module will initialize the board and communicate to the PC.

If this MCU-430F5438A-MVK is part of the MAVRK Starter Kit see [Getting Started with your MAVRK Kit](#).

Otherwise, follow the Getting Started steps outlined in the [MB-PRO-MVK MAVRK Module](#)

### 3.4 EVM Test Points

This diagram shows all the test points accessible on the MCU-430F5438A-MVK. Test points with a black insulator are Ground. Two large rectangular ground pads are provided near the corners of the board. These are a convenient place to connect O-Scope alligator ground clips.



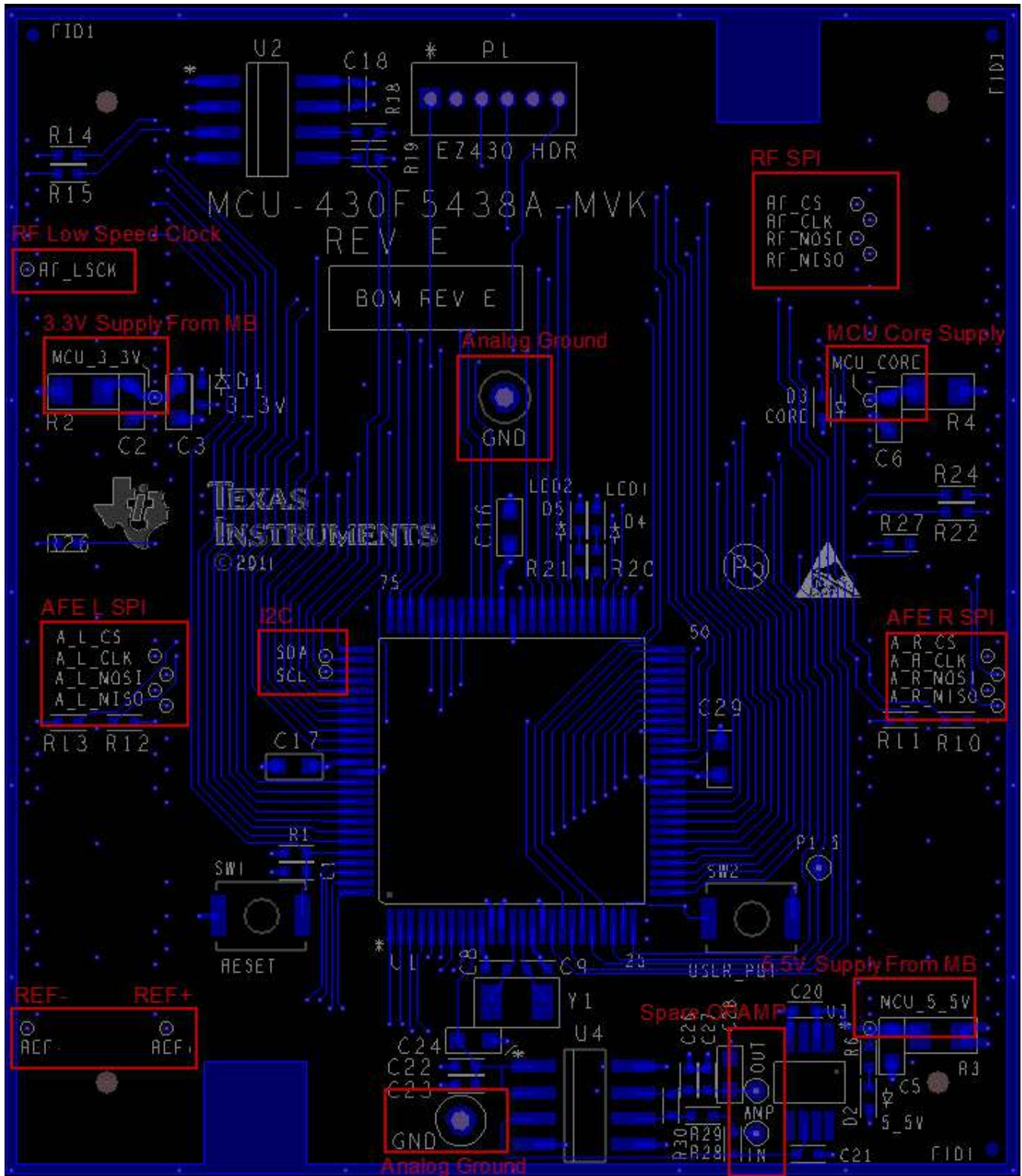


Figure 3.

### 3.5 EVM LEDs

#### 3.5.1 RED LED

- D4 is connected to P7.2 on the MSP430. It can be used to indicate an error reported by the processor.

#### 3.5.2 GREEN LED

- D1 indicates that the 3.3 volt power supply from the [MAVRK Motherboard](#) is present.

#### 3.5.3 YELLOW LEDs

- D3 indicates that the MCU\_core supply from the [MAVRK Motherboard](#) is present. This supply is not used by this EVM.
- D5 is connected to P7.3 on the MSP430. It can be used to indicate a warning reported by the processor.

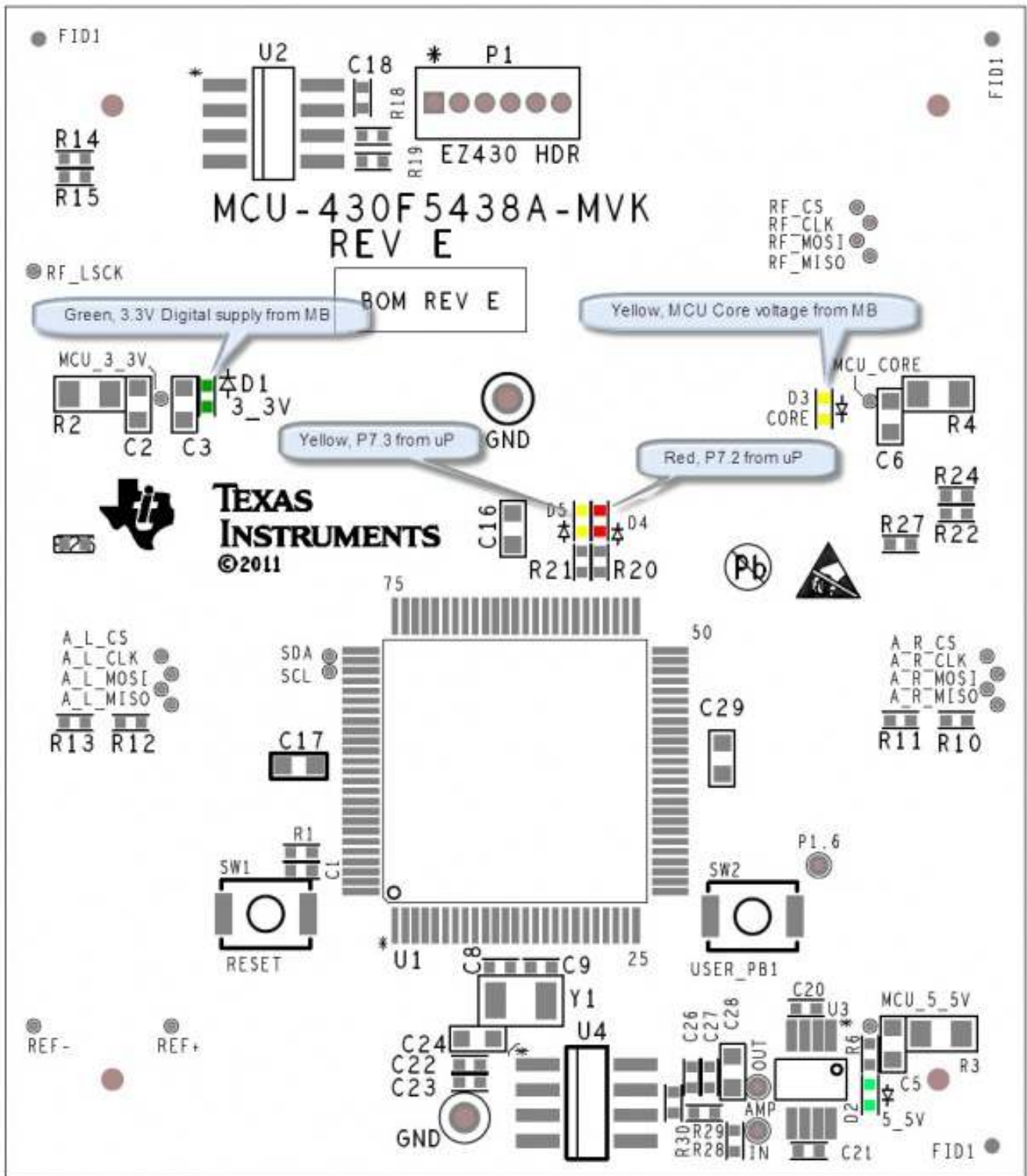


Figure 4.

## 4 Software Description

### 4.1 MAVRK Software Minimum Requirements

- [IAR Embedded Workbench](#) software or [TI Code Composer Studio](#) software installed on PC
- [MSP-FET430UIF - MSP430 USB Debugging Interface](#)
- USB Cable(A to Micro AB) to power the MAVRK Pro motherboard
- Windows XP SP3 or Windows 7

### 4.2 How to get the MAVRK Software

You will need the MAVRK Software repository installed on your PC. This repository will sync the MAVRK firmware to your PC.

Please see [Software Installation Guide](#).

### 4.3 Where do I find the MAVRK Qt Demo Application?

An application to visual packet information from the embedded system can be found in the **mavrk\_qt\_tool** software repository under the **Released Version - QT Demo Application** directory. Please see [Software Installation Guide](#) for instructions on cloning the QT Tool project.

If you desire to create your own Qt demonstration, please reference the following resources:

- [MAVRK Qt GUI SDK Installation Guide](#)
- [MAVRK Qt GUI Build Guide](#)

### 4.4 Where do I find the Demo and Test Code?

From the software library, synchronized from the Gerrit server you will find:

- Driver code related to the specific part can be found in a folder under the **mavrk\_embeddedModular\_EVM\_Libraries\Components** directory.
- Projects utilizing this part are located under the **mavrk\_embeddedModular\_EVM\_Projects** folder.
- Specific related projects for this part are:

For instructions on testing the MCU-430F5438A-MVK, please see the [Testing the MSP430F5438A MVK Module](#) wiki page.

## 5 Board Files

### 5.1 Bill of Materials (BOM)

[Download PDF](#) of the bill of materials.

MCU-430F5438A-MVK Bill of Materials

QTY	REF	DESCRIPTION	MANUFACTURER	PART NUMBER	UNIT PRICE	TOTAL PRICE
1	U2	MCU-430F5438A-MVK	TI	430F5438A-MVK		
1	P1	E2430 HDR	TE	E2430		
1	C18	RES	TE	0603-1000-1000		
1	R24	RES	TE	0603-1000-1000		
1	RT5	RES	TE	0603-1000-1000		
1	MCU_3_3V	RES	TE	0603-1000-1000		
1	R2	RES	TE	0603-1000-1000		
1	C2	RES	TE	0603-1000-1000		
1	C3	RES	TE	0603-1000-1000		
1	D01	RES	TE	0603-1000-1000		
1	GND	RES	TE	0603-1000-1000		
1	REV_CODE	RES	TE	0603-1000-1000		
1	D2	RES	TE	0603-1000-1000		
1	CORE	RES	TE	0603-1000-1000		
1	R4	RES	TE	0603-1000-1000		
1	R24	RES	TE	0603-1000-1000		
1	R27	RES	TE	0603-1000-1000		
1	R22	RES	TE	0603-1000-1000		
1	A_8_C3	RES	TE	0603-1000-1000		
1	A_2_T18	RES	TE	0603-1000-1000		
1	A_2_M151	RES	TE	0603-1000-1000		
1	A_2_W150	RES	TE	0603-1000-1000		
1	RT3	RES	TE	0603-1000-1000		
1	RT2	RES	TE	0603-1000-1000		
1	C17	RES	TE	0603-1000-1000		
1	R1	RES	TE	0603-1000-1000		
1	R317	RES	TE	0603-1000-1000		
1	REF1	RES	TE	0603-1000-1000		
1	REF4	RES	TE	0603-1000-1000		
1	U1	RES	TE	0603-1000-1000		
1	C9	RES	TE	0603-1000-1000		
1	V1	RES	TE	0603-1000-1000		
1	U4	RES	TE	0603-1000-1000		
1	C24	RES	TE	0603-1000-1000		
1	C22	RES	TE	0603-1000-1000		
1	C23	RES	TE	0603-1000-1000		
1	GND	RES	TE	0603-1000-1000		
1	U3	RES	TE	0603-1000-1000		
1	C28	RES	TE	0603-1000-1000		
1	U5	RES	TE	0603-1000-1000		
1	C5	RES	TE	0603-1000-1000		
1	3_3V	RES	TE	0603-1000-1000		
1	R3	RES	TE	0603-1000-1000		
1	C7	RES	TE	0603-1000-1000		
1	F101	RES	TE	0603-1000-1000		

Figure 5.

**5.2 Layout (PDF)**

[Download PDF](#) of additional board layers.

MCU-430F5438A-MVK Board Top Silkscreen

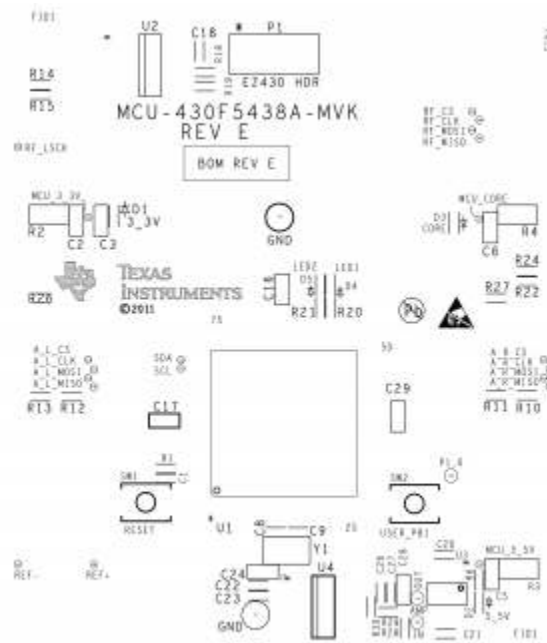
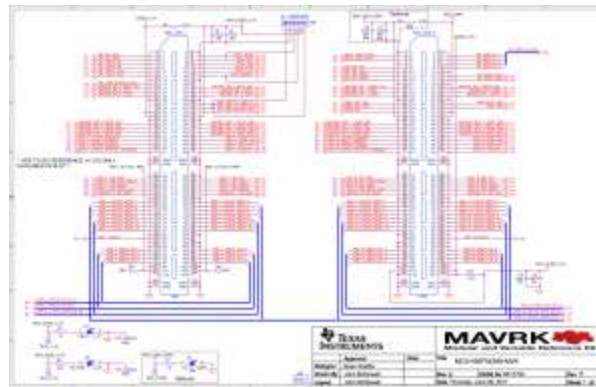


Figure 6.

**5.3 Schematics (PDF)**

[Download PDF](#) of the schematic.

MCU-430F5438A-MVK Schematics



**Figure 7.**

#### **5.4 Fabrication Drawings (PDF)**

[Download PDF](#) of the fabrication drawing.

MCU-430F5438A-MVK Fabrication Drawing



**Figure 8.**

#### **5.5 Request Gerber and Schematic files**

To request Gerber or schematic files for the MCU-430F5438A-MVK module, please visit the [MAVRK Gerber Request](#) webpage.

### **6 MAVRK Links**

#### **6.1 I want more info on MAVRK**

[MAVRK Home Page](#)

#### **6.2 I have MAVRK Questions**

[MAVRK Forum](#) (Recommended):

#### **6.3 I want more Technical Info on MAVRK Hardware**



**Table 1.**

<ul style="list-style-type: none"> <li>• <a href="#">Care and Feeding of a MAVRK Motherboard</a></li> <li>• <a href="#">Getting Started with your MAVRK Kit</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK AFE Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK MCU Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK PMU Charger Sub-Modules</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Hardware Design Guide for MAVRK PMU DC/DC Sub-Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK PMU Gas Gauge Sub-Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK PMU High-Power DC/DC Sub-Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK SCI Modules</a></li> <li>• <a href="#">Hardware Design Guide for MAVRK SCI Sub-Modules</a></li> <li>• <a href="#">Hardware Design Guide for the uMAVRK Analog Interface</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Hardware Design Guide for the uMAVRK Power Interface</a></li> <li>• <a href="#">I2C Addresses on the MAVRK Pro Motherboard</a></li> <li>• <a href="#">LEDs - Recommended Resistor Values</a></li> <li>• <a href="#">MAVRK Partners and Resources</a></li> <li>• <a href="#">Template - Hardware User's Guide</a></li> </ul>
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## 6.4 I want more Technical Info on MAVRK Software

**Table 2.**

<ul style="list-style-type: none"> <li>• <a href="#">Demo Application - ADS1298 Demo on MAVRK</a></li> <li>• <a href="#">Demo Application - Sensors on uMAVRK</a></li> <li>• <a href="#">Demo Application - TCA8418 on MAVRK</a></li> <li>• <a href="#">Demo Application - UART Passthrough on MAVRK</a></li> <li>• <a href="#">Demo Application - UART Receiver on MAVRK</a></li> <li>• <a href="#">Demo Application - Wireless Keyboard on MAVRK</a></li> <li>• <a href="#">How to Convert a Project from IAR to CCS</a></li> <li>• <a href="#">IAR Broken Options Error</a></li> <li>• <a href="#">IAR Project Open Error</a></li> <li>• <a href="#">MAVRK - TortoiseGit Frequently Asked Questions</a></li> <li>• <a href="#">MAVRK Partners and Resources</a></li> <li>• <a href="#">MAVRK Qt Demo Application User Guide</a></li> <li>• <a href="#">MAVRK Qt GUI Build Guide</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">MAVRK Qt GUI SDK Installation Guide</a></li> <li>• <a href="#">MAVRK Radio Network</a></li> <li>• <a href="#">MAVRK Software Developers Guide</a></li> <li>• <a href="#">MAVRK Software Installation Guide</a></li> <li>• <a href="#">Running the TCA-8418 Demo (CCS)</a></li> <li>• <a href="#">Running the TCA8418 Demo (IAR)</a></li> <li>• <a href="#">Software - API Documentation for MAVRK Embedded Software Libraries</a></li> <li>• <a href="#">Software - CC11xx, CC25xx, CC430 Radio API Guide</a></li> <li>• <a href="#">Software - CPU Power Down Logic on Standard MAVRK Applications</a></li> <li>• <a href="#">Software - Coding Conventions for MAVRK Software</a></li> <li>• <a href="#">Software - Customizing a Demo Project</a></li> <li>• <a href="#">Software - Doxygen Conventions for MAVRK Software</a></li> <li>• <a href="#">Software - MAVRK Adding the Radio Demo to Another Demo</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Software - MAVRK Embedded Project Abstraction Layers</a></li> <li>• <a href="#">Software - MAVRK I2C Bus Functions</a></li> <li>• <a href="#">Software - MAVRK SPI Bus Functions</a></li> <li>• <a href="#">Software - MAVRK UART Functions</a></li> <li>• <a href="#">Software - Main Processing Loop in Standard MAVRK Applications</a></li> <li>• <a href="#">Software - My First MAVRK Application (Using Code Composer)</a></li> <li>• <a href="#">Software - My First MAVRK Application (Using IAR)</a></li> <li>• <a href="#">Software - Programming with Elprotronic's FET-Pro430 Flash Programmer</a></li> <li>• <a href="#">Software - Selecting the CCS Workspace Directory</a></li> <li>• <a href="#">Software - Troubleshooting the MAVRK COM Port Connection to QT</a></li> <li>• <a href="#">Software Design Guide for MAVRK Modules</a></li> <li>• <a href="#">Stellaris-ICDI Programming</a></li> </ul>
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## 6.5 I want to get a MAVRK board

[MAVRK Home Page](#)

## 7 Important Notices

### 7.1 ESD Precautions

### 7.2 Certifications

[FCC and EMC test report for the MAVRK STK-PRO430-MVK Starter Kit, featuring the MCU-430F5438A-MVK MAVRK Module](#)

[Eco-Info & Lead-Free Home](#)

[RoHS Compliant Solutions](#)



## [Statement on Registration, Evaluation, Authorization of Chemicals \(REACH\)](#)

### **7.3 Evaluation Board/Kit Important Notice**

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### **7.5 EVM Warnings and Restrictions**

It is important to operate this EVM within the input voltage range of  $-2.5V$  to  $+5V$  and the output voltage range of  $0V$  to  $5V$ . Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power. Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than  $+30^{\circ}C$ . The EVM is designed to operate properly with certain components above  $+30^{\circ}C$  as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

**Table 3.**

	<i>For technical support on MAVRK please post your questions on <a href="#">The MAVRK Toolbox Forum</a> . Please post only comments about the article <b>MCU-430F5438A-MVK MAVRK Module</b> here.</i>
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Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
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