MCU-430F5438A-MVK MAVRK Module

Technical Reference Manual

![Texas Instruments logo]

Contents

MCU-430F5438A-MVK MAVRK Module

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
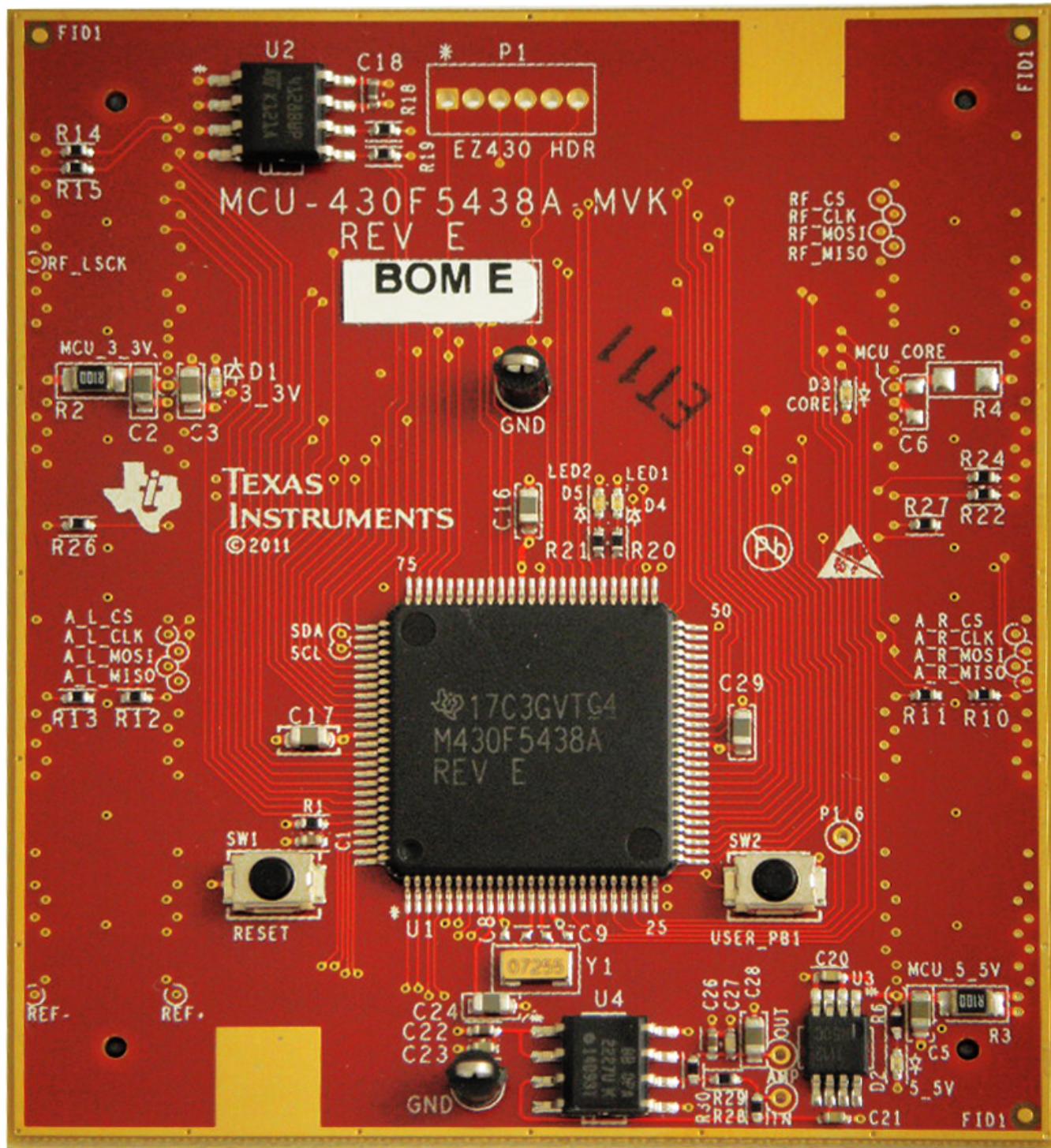
Figure 1.

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 communicaion 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
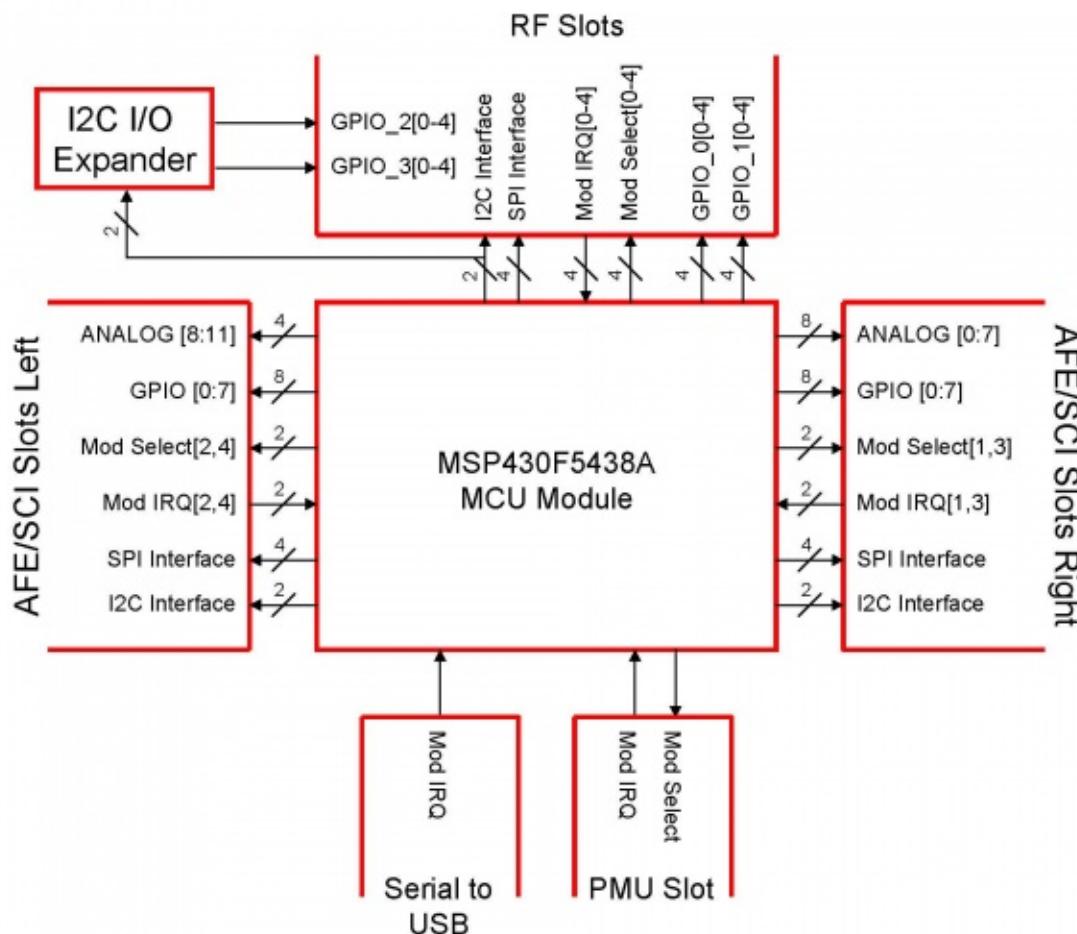
Figure 2.

- 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.

Copyright © 2011, Texas Instruments Incorporated
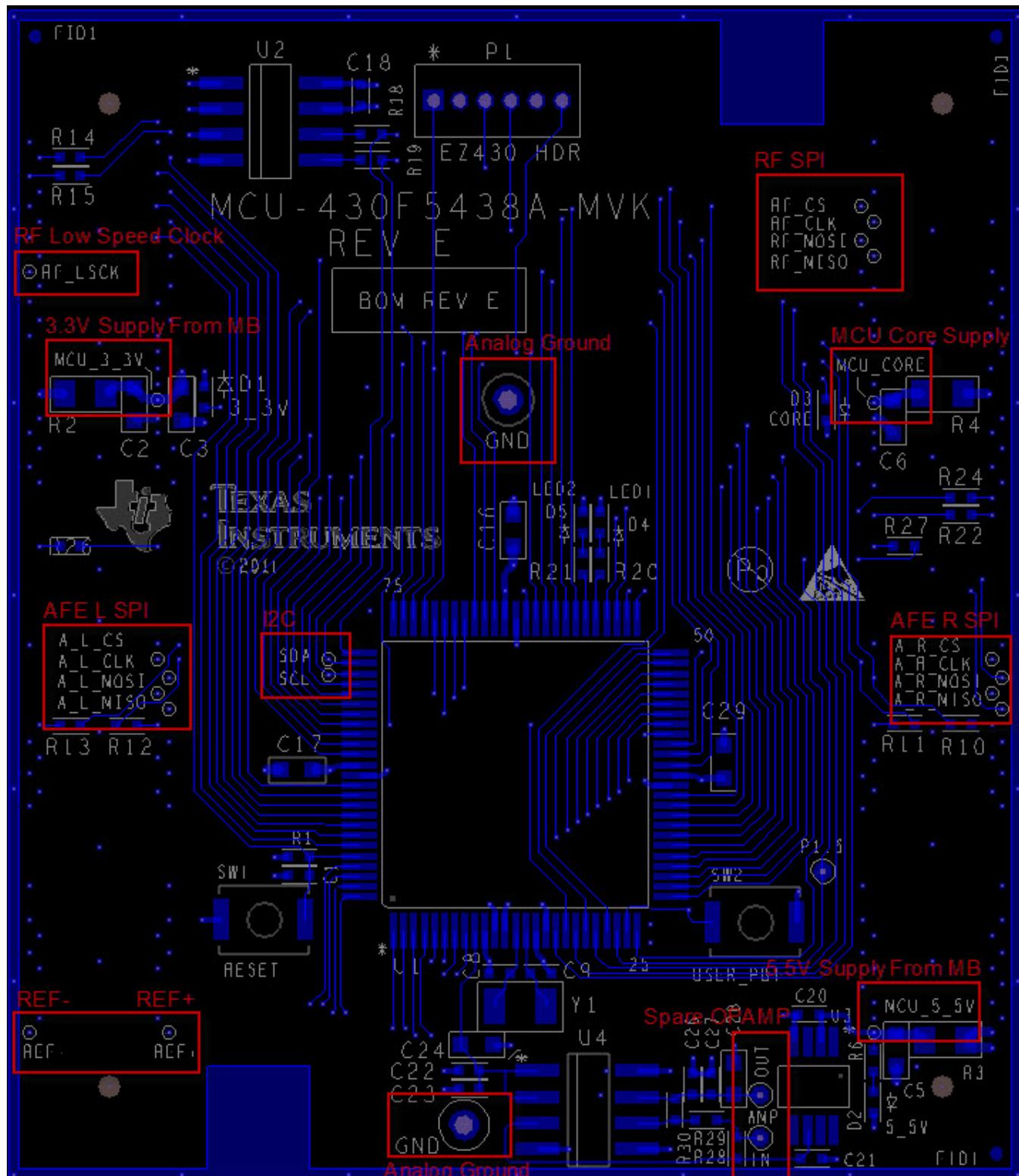
3.5 EVM LEDs

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 an warning reported by the processor.
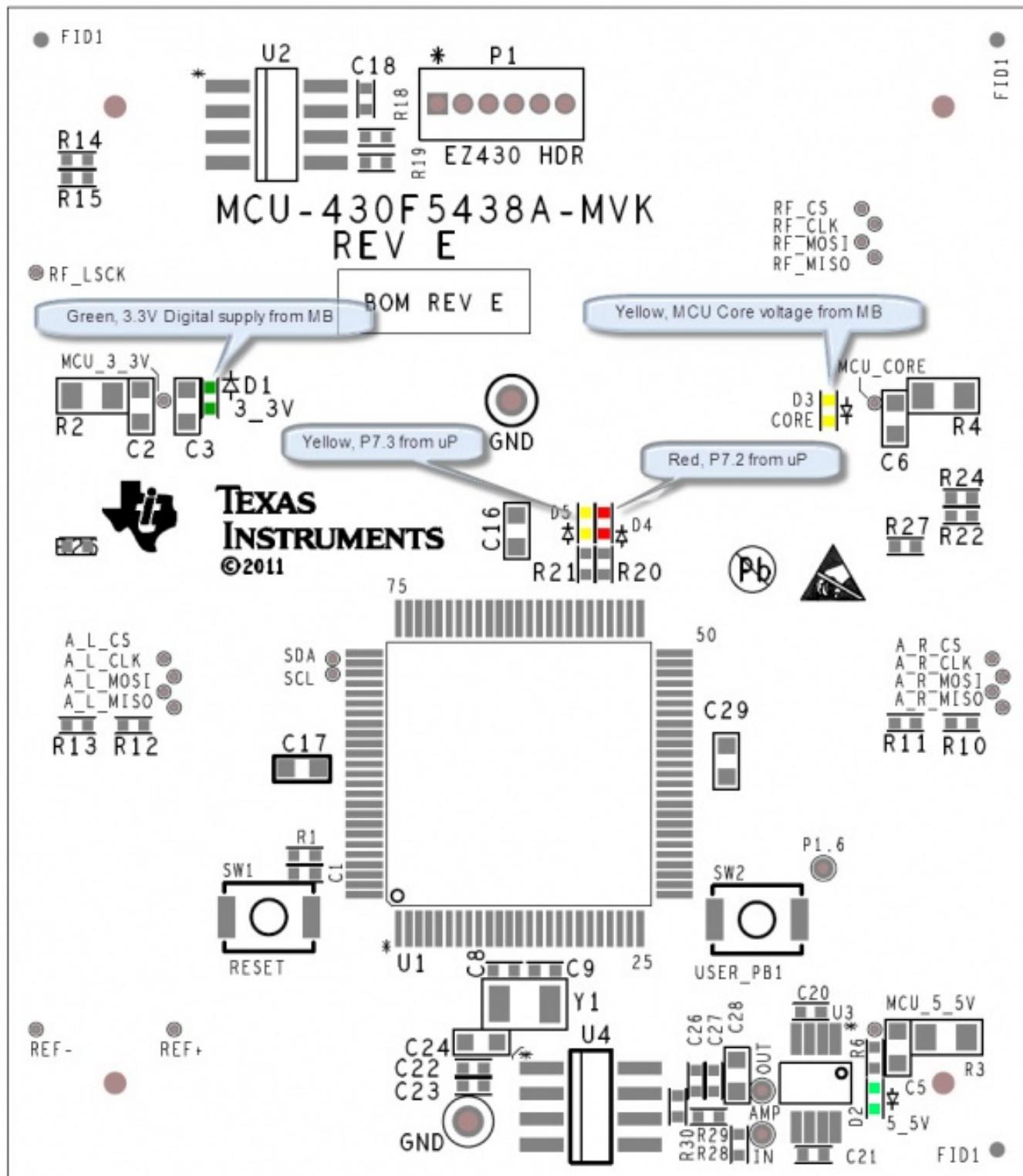
Figure 4.

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_embedded\Modular_EVM_Libraries\Components** directory.
- Projects utilizing this part are located under the **mavrk_embedded\Modular_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

Figure 5.

5.2 Layout (PDF)

Download PDF of additional board layers.

MCU-430F5438A-MVK Board Top Silkscreen
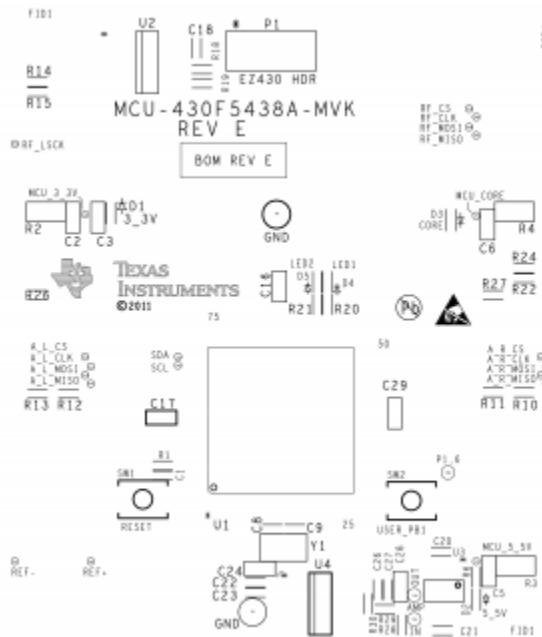
Figure 6.

5.3 Schematics (PDF)

Download PDF of the schematic.

MCU-430F5438A-MVK Schematics
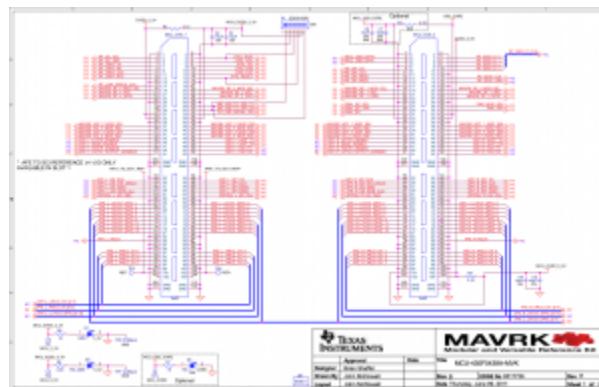
Figure 7.

5.4 Fabrication Drawings (PDF)

Download PDF of the fabrication drawing.

MCU-430F5438A-MVK Fabrication Drawing
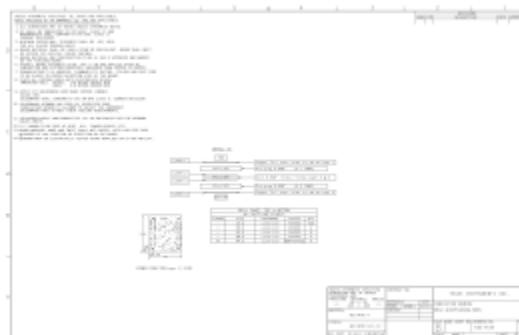
Figure 8.

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.

• Care and Feeding of a MAVRK Motherboard • Getting Started with your MAVRK Kit • Hardware Design Guide for MAVRK AFE Modules • Hardware Design Guide for MAVRK MCU Modules • Hardware Design Guide for MAVRK Modules • Hardware Design Guide for MAVRK PMU Charger Sub-Modules	• Hardware Design Guide for MAVRK PMU DC/DC Sub-Modules • Hardware Design Guide for MAVRK PMU Gas Gauge Sub-Modules • Hardware Design Guide for MAVRK PMU High-Power DC/DC Sub-Modules • Hardware Design Guide for MAVRK SCI Modules • Hardware Design Guide for MAVRK SCI Sub-Modules • Hardware Design Guide for the uMAVRK Analog Interface	• Hardware Design Guide for the uMAVRK Power Interface • I2C Addresses on the MAVRK Pro Motherboard • LEDs - Recommended Resistor Values • MAVRK Partners and Resources • Template - Hardware User's Guide

6.4 I want more Technical Info on MAVRK Software

Table 2.

• Demo Application - ADS1298 Demo on MAVRK • Demo Application - Sensors on uMAVRK • Demo Application - TCA8418 on MAVRK • Demo Application - UART Passthrough on MAVRK • Demo Application - UART Receiver on MAVRK • Demo Application - Wireless Keyboard on MAVRK • How to Convert a Project from IAR to CCS • IAR Broken Options Error • IAR Project Open Error • MAVRK - TortoiseGit Frequently Asked Questions • MAVRK Partners and Resources • MAVRK Qt Demo Application User Guide • MAVRK Qt GUI Build Guide	• MAVRK Qt GUI SDK Installation Guide • MAVRK Radio Network • MAVRK Software Developers Guide • MAVRK Software Installation Guide • Running the TCA-8418 Demo (CCS) • Running the TCA8418 Demo (IAR) • Software - API Documentation for MAVRK Embedded Software Libraries • Software - CC11xx, CC25xx, CC430 Radio API Guide • Software - CPU Power Down Logic on Standard MAVRK Applications • Software - Coding Conventions for MAVRK Software • Software - Customizing a Demo Project • Software - Doxygen Conventions for MAVRK Software • Software - MAVRK Adding the Radio Demo to Another Demo	• Software - MAVRK Embedded Project Abstraction Layers • Software - MAVRK I2C Bus Functions • Software - MAVRK SPI Bus Functions • Software - MAVRK UART Functions • Software - Main Processing Loop in Standard MAVRK Applications • Software - My First MAVRK Application (Using Code Composer) • Software - My First MAVRK Application (Using IAR) • Software - Programming with Elprotronic's FET-Pro430 Flash Programmer • Software - Selecting the CCS Workspace Directory • Software - Troubleshooting the MAVRK COM Port Connection to QT • Software Design Guide for MAVRK Modules • Stellaris-ICDI Programming

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

Texas Instruments (TI) provides the enclosed product(s) under the following conditions: This evaluation board/kit is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives. Should this evaluation board/kit not meet the specifications indicated in the Users Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Please read the Users Guide and, specifically, the Warnings and Restrictions notice in the Users Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh. No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

7.4   FCC Warning

This evaluation board/kit is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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°C. The EVM is designed to operate properly with certain components above +30°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.

	For technical support on MAVRK please post your questions on The MAVRK Toolbox Forum *. Please post only comments about the article* **MCU-430F5438A-MVK MAVRK Module** *here.*

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		

TI E2E Community Home Page   e2e.ti.com