RF-TCA8418-MVK MAVRK Module

User's Guide

Literature Number: SLAU383
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Contents

RF-TCA8418-MVK MAVRK Module

This document goes into the details of the RF-TCA8418-MVK board. It includes information about how the module functions and how to use the board. Schematics and layout documentation are also included.

1 EVM Overview

The RF-TCA8418-MVK module provides I2C access to a keypad and joystick with select. The module is compatible with any Modular and Versatile Reference Kit (MAVRK) motherboard with an open RF slot. The RF slot is designed for communications and as an input interface between the MAVRK motherboard and a PC, external components, or users. This module connects to the motherboard's RF port. For a full list of RF pinouts with description please see the RF Pinout for MAVRK wiki page.

1.1 EVM Description

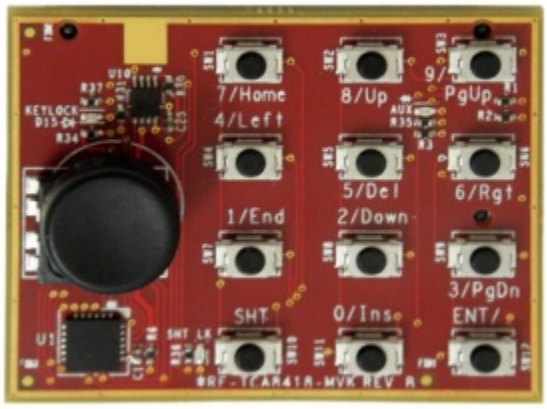

Figure 1. RF-TCA8418-MVK MAVRK Module

The RF-TCA8418-MVK Module provides row/column scanning of:

- Twelve (12) switch keypad with press and release detect.
- A four (4) position joystick (Up, Down, Right, Left) plus a *push to select* function.

TCA8418 features highlighted by this MAVRK module include:

- Last ten (10) keystroke storage.
- Keylock and Unlock functionality.

1.2 Highlighted Products

- TCA8418 I2C Controlled Keypad Scan IC
- TS5A2066 Dual-Channel 10-Ohm SPST Analog Switch

1.3 Block Diagram

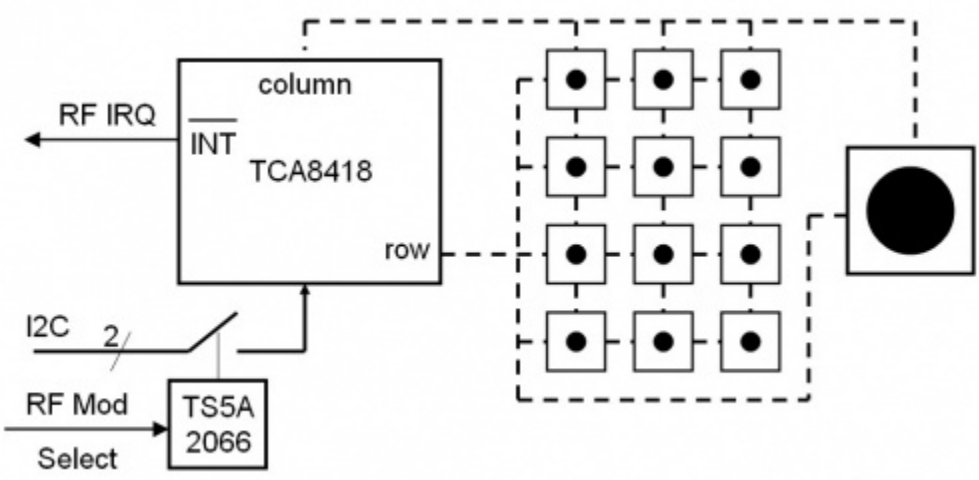

Figure 2. A block diagram of the RF-TCA8418-MVK MAVRK Module

1.4 EVM Wiki

RF-TCA8418-MVK MAVRK Module wiki page

1.5 EVM Landing Page

RF-TCA8418-MVK MAVRK Module tool folder

2 Hardware Description

2.1 Power Requirements

3.3V DC is supplied to the RF-TCA8418-MVK through the RF Connector (RF2, pin 9). The RF-TCA8418-MVK module can operate over the voltage range of 1.65V to 3.65V DC with a typical current draw of less than 1mA.

2.2 Getting Started: Configuring the EVM

Configuring the RF-TCA8418-MVK EVM is as simple as installing it into one (1) of the RF slots on a motherboard, such as the MAVRK Pro Motherboard.

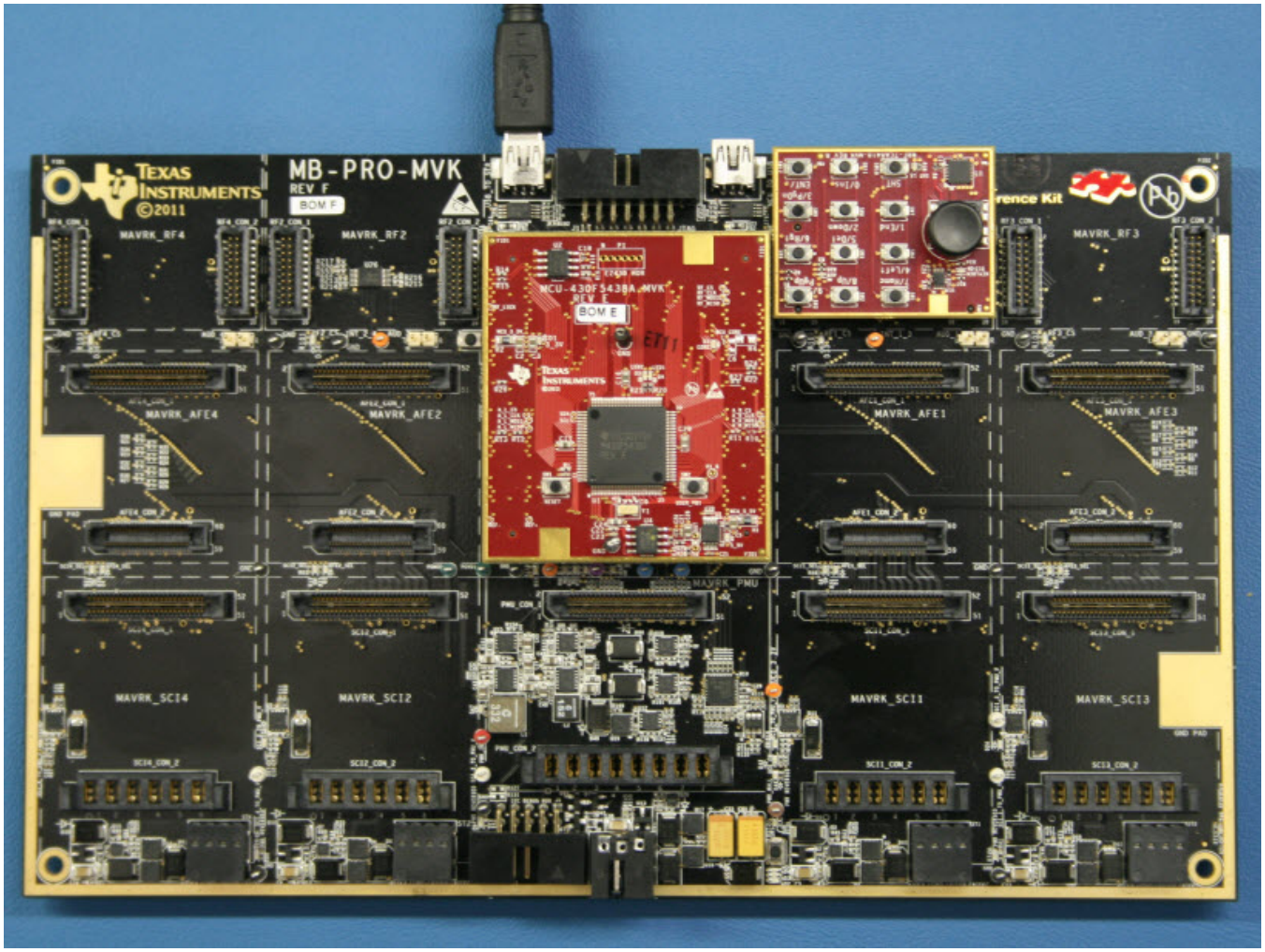

Figure 3. RF-TCA8418-MVK Module on the MAVRK Pro Motherboard

Note: Most demos and test routines use MAVRK_RF1, but any of the RF slots can be used as long as the changes are noted in the #define of the software. For example, in the TCA8418 demo project, the RIGHT and LEFT are #defined to the MAVRK_RF3 and MAVRK_RF4 slots.

```
/*********************************************************************************************************************
*                                   Definitions
**********************************************************************************************************************
#define RIGHT    MAVRK_RF3
#define LEFT     MAVRK_RF4
**********************************************************************************************************************
*                                   Prototypes
**********************************************************************************************************************

/*********************************************************************************************************************
*                                   Global Variables
**********************************************************************************************************************
// We will allocate 3 PC communication packets for this test. One will be used to send TCA8418 data, one will be used to ACK PC cc
//  and one will be used to receive commands from the PC. Note that we could have re-used a packet for the
//  ACKs in order to save memory.

PC_Interface_Packet_type   PcRcvPacket;
```

Figure 4. TCA8418 RF Slots Defined in the C Code

These definitions are used further in the code for initialization of the module and later for the checking for a key press for that module.

```
/*********************************************************************************************************************
/*    Initialize TCA8418 Component
/*********************************************************************************************************************
//  Right is defined in the Definitions section of this file
    mvk_Initialize_Keyboard (RIGHT);
//     For Demo's requiring a second keyboard remove comments on the line below
    mvk_Initialize_Keyboard (LEFT);
/*********************************************************************************************************************
/*    Use for testing the PC Interface from MAVRK TCA8418 board to a host PC
/*********************************************************************************************************************
//     mvk_Send_TCA8418_Test_Packet(TCA8418_Packet_Data, TCA8418_DEVICE_SLOT, 1);         // send one set of test packets

#ifdef DEBUG
    // This call is necessary to enable any devices using the GPIOs on the AFE slots. It is used in DEBUG mode to light
    mvk_Enable_AFE_Latched_GPIOs ();              // Enable the AFE Latched GPIO to start output of data
#endif

/*********************************************************************************************************************
*                               main.c    -    Background Tasks
**********************************************************************************************************************
    mvk_UART_Debug_PrintF_Flush ("\033[2J", 4);
    mvk_UART_Debug_PrintF_Flush ("\r\nTCA8418-MVK Demo\r\n", 20);
    mvk_UART_Debug_PrintF_Flush ("\r\nMAVRK packets and terminal messages will be provided for", 58);
    mvk_UART_Debug_PrintF_Flush ("\r\neach press and release of keys.\r\n\r\n", 37);

    while (1)
    {
        idle_count++;                                                         // Idle Count is incremented every time

        if (mvk_Is_User_Button_Pushed () )
        {
            mvk_Toggle_MCU_LED (MCU_YELLOW);
            mvk_Clear_User_Button_Status ();
        }

        // Is there a keypress and TCA8418 data ready to send to the PC?
        if (TCA8418_DATA_AVAILABLE == mvk_Check_and_Process_Key_Press (RIGHT)) // Send current key events to the PC Int
        {
            mvk_Toggle_MCU_LED (MCU_YELLOW);
            idle_count = 0;
        }
```

Figure 5. TCA8418 RF Slot Definitons Used as C Code Variable Names

The default slots of MAVRK_RF3 and MAVRK_RF4 from the demo can be easily changed to, for example, MAVRK_RF1 and MAVRK_RF2 by simply changing the RIGHT (#define RIGHT MAVRK_RF1) and LEFT (#define LEFT MAVRK_RF2).

2.3 EVM Connectors, Fuses, and Switches

The RF-TCA8418-MVK EVM has two connectors on the back side of the module that connect it to an RF slot on a motherboard like the MAVRK Pro Motherboard. For a full list of RF pinouts with description please see the RF Pinout for MAVRK wiki page.

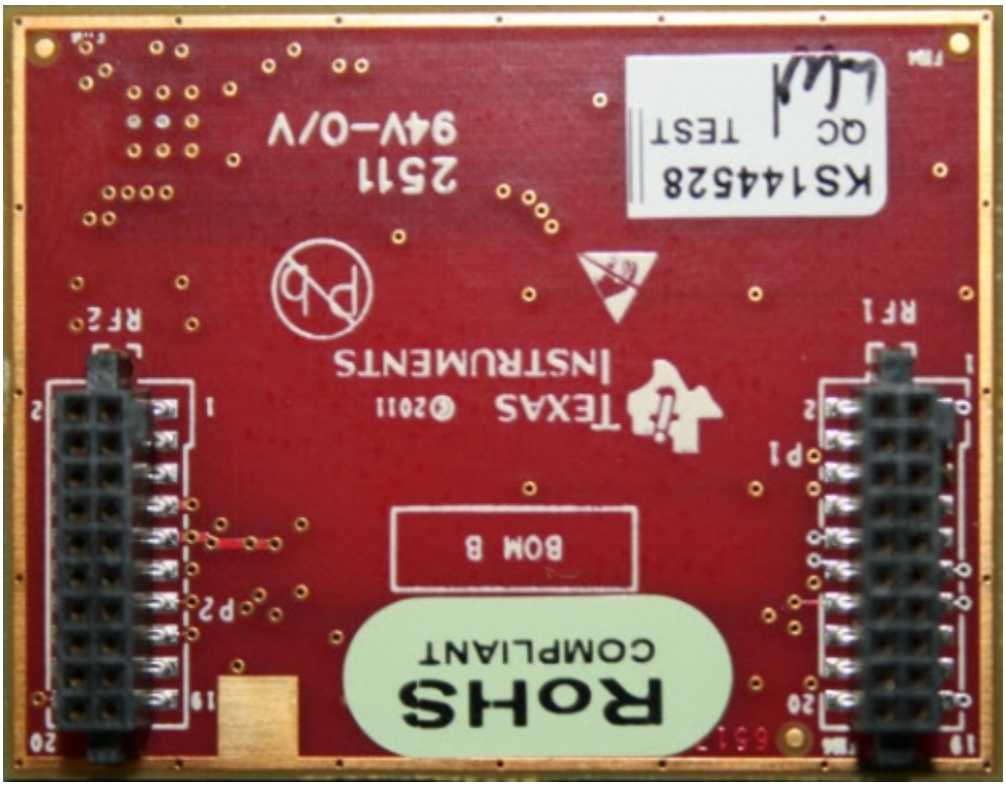

Figure 6. Back side of the RF-TCA8418-MVK MAVRK Module, showing the RF connectors

The RF-TCA8418-MVK EVM consists of twelve (12) momentary switch push buttons and one (1) 8 position navigation switch with a *push to select* function. The function of 11 of the momentary switches is defined by the 12th switch, the SHIFT switch.

The primary functions (SHIFT disabled) are shown below:

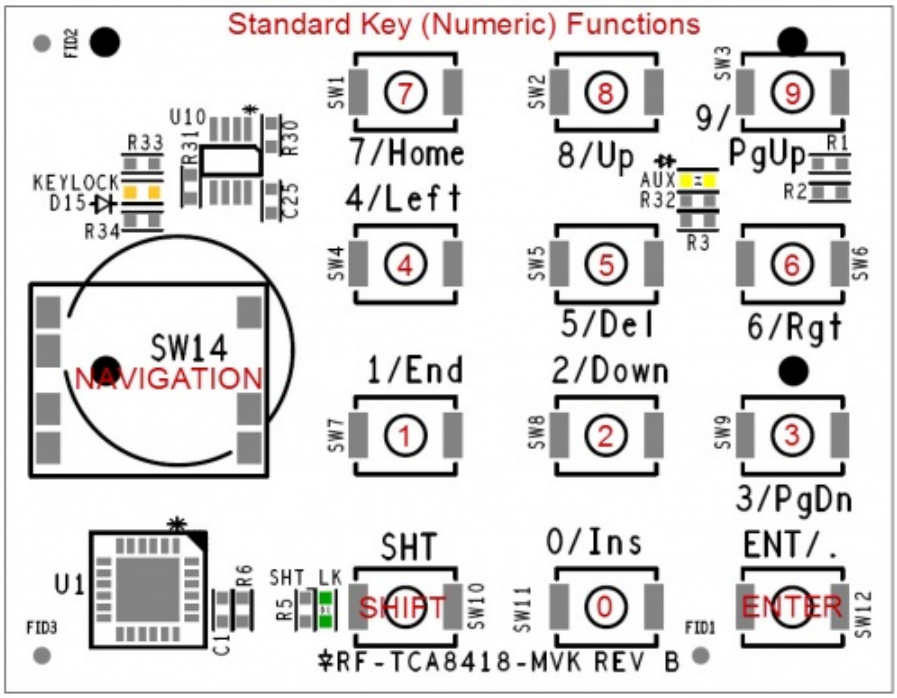

Figure 7. Functions of the keys while SHIFT is disabled

The SHIFT Lock functions (SHIFT enabled) are shown below:

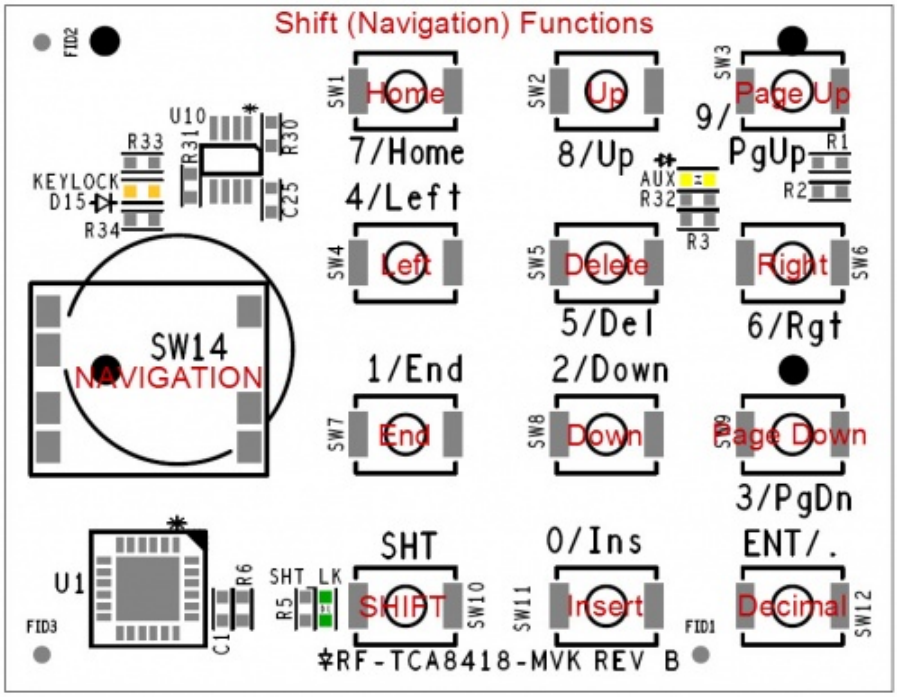

Figure 8. Functions of the keys while SHIFT is enabled

2.4 EVM Test Points

Due to the simple nature of the RF-TCA8418-MVK, the EVM has no test points. The polling of the I2C lines is can be done by utilizing an RF Breakout module in the RF slot adjacent to the slot containing the RF-TCA8418-MVK.

2.5 EVM LEDs

The RF-TCA8418-MVK Module has 3 LEDs:

- A green LED signifying a Shift-Lock function
- An orange LED signifying a Key-Lock function
- A user defined yellow LED

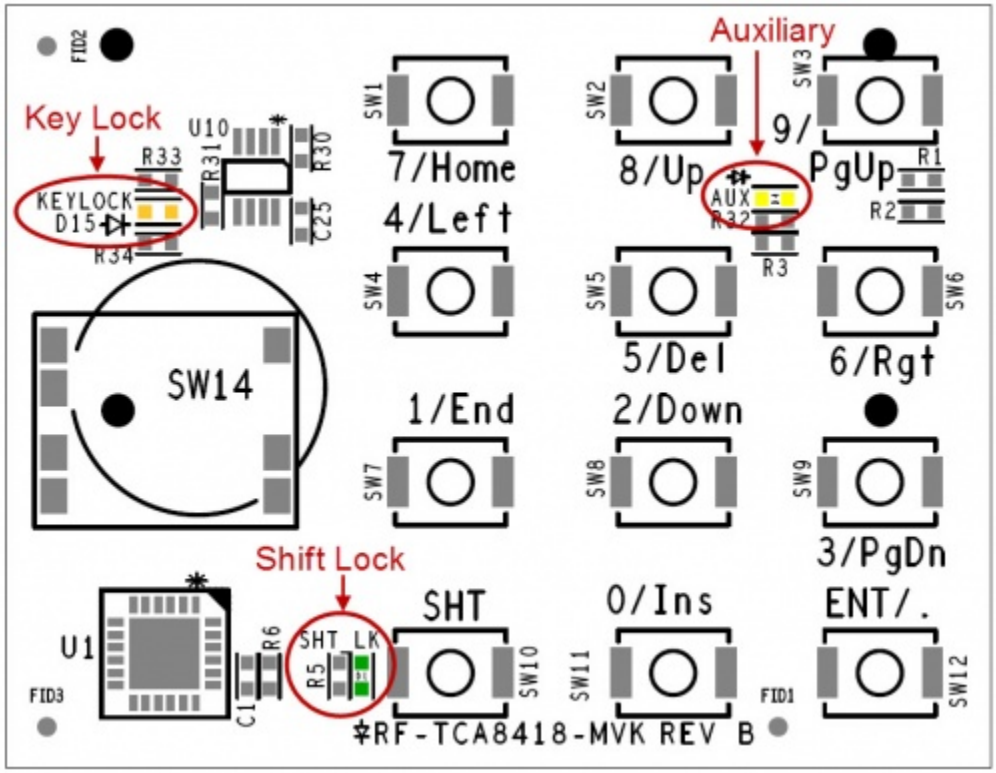

Figure 9. Map of LEDs on the RF-TCA8418-MVK MAVRK Module

3 Software Description

3.1 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

3.2 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.

3.3 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

3.4 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:

Please refer to the links below for instructions on running a demo application with the TCA8418.

- Running the TCA8418 Demo on CCS
- Running the TCA8418 Demo on IAR

4 Board Files

4.1 Bill of Materials (BOM)

Download a PDF of the bill of materials.

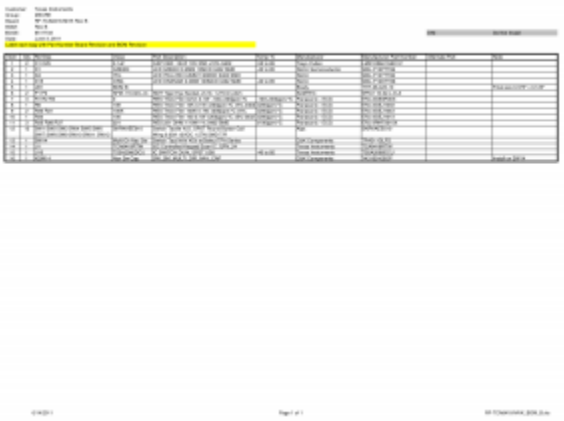

Figure 10. RF-TCA8418-MVK Bill of Materials

4.2 Layout (PDF)

Download a PDF of additional board layers.

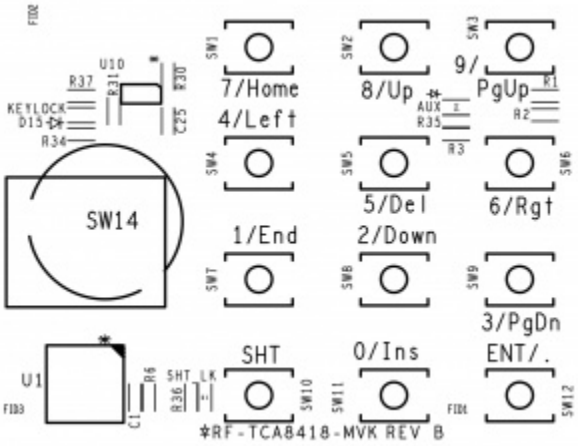

Figure 11. RF-TCA8418-MVK Board Top Silkscreen

4.3 Schematics (PDF)

Download a PDF of the schematic.

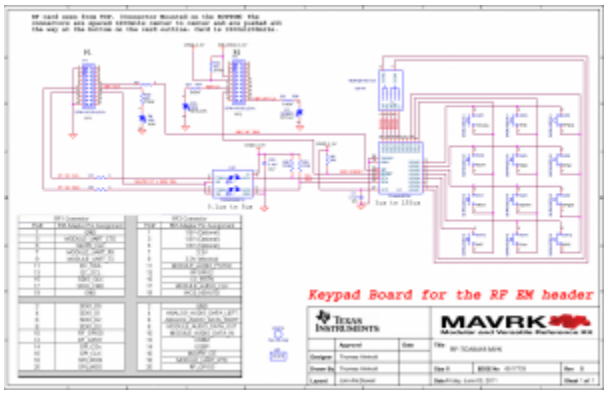

Figure 12. RF-TCA8418-MVK Schematic

4.4 Fabrication Drawings (PDF)

Download a PDF of the fabrication drawing.

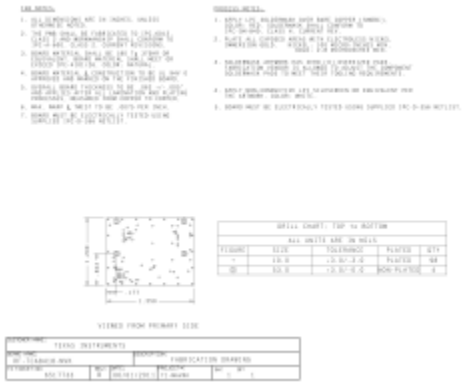

Figure 13. RF-TCA8418-MVK Fabrication Drawing

4.5 Request Gerber and Schematic files

To request Gerber or schematic files for the RF-TCA8418-MVK module, please visit the MAVRK Gerber Request webpage.

5 MAVRK Links

5.1 I want more info on MAVRK

MAVRK Home Page

5.2 I have MAVRK Questions

MAVRK Forum (Recommended):

5.3 I want more Technical Info on MAVRK Hardware

• 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 • Template - Hardware User's Guide

5.4 I want more Technical Info on MAVRK Software

• How to Convert a Project from IAR to CCS	• Software - CC11xx, CC25xx, CC430 Radio API Guide

5.5 I want to get a MAVRK board

MAVRK Home Page

6 Important Notices

6.1 ESD Precautions

The following guidelines should be followed in order to avoid ESD damage to the board components:

- Any person handling boards must be grounded either with a wrist strap or ESD protective footwear, used in conjunction with a conductive or static-dissipative floor or floor mat.
- The work surface where boards are placed for handing, processing, testing, etc., must be made of static-dissipative material and be grounded to ESD ground.
- All insulator materials either must be removed from the work area or they must be neutralized with an ionizer. Static-generating clothes should be covered with an ESD-protective smock.
- When boards are being stored, transferred between operations or workstations, or shipped, they must be maintained in a Faraday-shield container whose inside surface (touching the boards) is static dissipative.

6.2 Certifications

FCC standard EMC test report for the RF-TCA8418-MVK MAVRK Module aboard a MAVRK Pro Motherboard

ICES standard EMC test report for the RF-TCA8418-MVK MAVRK Module aboard a MAVRK Pro Motherboard

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Statement on Registration, Evaluation, Authorization of Chemicals (REACh)

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This EVM complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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6.5 Evaluation Board/Kit/Module (EVM) Warnings, Restrictions, and Disclaimers

6.5.1 Your Sole Responsibility and Risk

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1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.

2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.

3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.

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It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 60° C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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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
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RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
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