

RF-TCA8418-MVK MAVRK Module

User's Guide



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1	EVM Overview	5
1.1	EVM Description	5
1.2	Highlighted Products	5
1.3	Block Diagram	6
1.4	EVM Wiki	6
1.5	EVM Landing Page	6
2	Hardware Description	7
2.1	Power Requirements	7
2.2	Getting Started: Configuring the EVM	7
2.3	EVM Connectors, Fuses, and Switches	9
2.4	EVM Test Points	11
2.5	EVM LEDs	11
3	Software Description	12
3.1	MAVRK Software Minimum Requirements	12
3.2	How to get the MAVRK Software	12
3.3	Where do I find the MAVRK Qt Demo Application?	12
3.4	Where do I find the Demo and Test Code?	12
4	Board Files	13
4.1	Bill of Materials (BOM)	13
4.2	Layout (PDF)	13
4.3	Schematics (PDF)	14
4.4	Fabrication Drawings (PDF)	14
4.5	Request Gerber and Schematic files	14
5	MAVRK Links	15
5.1	I want more info on MAVRK	15
5.2	I have MAVRK Questions	15
5.3	I want more Technical Info on MAVRK Hardware	15
5.4	I want more Technical Info on MAVRK Software	15
5.5	I want to get a MAVRK board	15
6	Important Notices	16
6.1	ESD Precautions	16
6.2	Certifications	16
6.3	Evaluation Board/Kit/Module (EVM) Additional Terms	16
6.4	United States FCC and Canada IC Regulatory Compliance Information	17
6.5	Evaluation Board/Kit/Module (EVM) Warnings, Restrictions, and Disclaimers	17
6.5.1	Your Sole Responsibility and Risk	17
6.5.2	Certain Instructions	17
6.5.3	Agreement to Defend, Indemnify and Hold Harmless	18
6.5.4	Safety-Critical or Life-Critical Applications	18

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

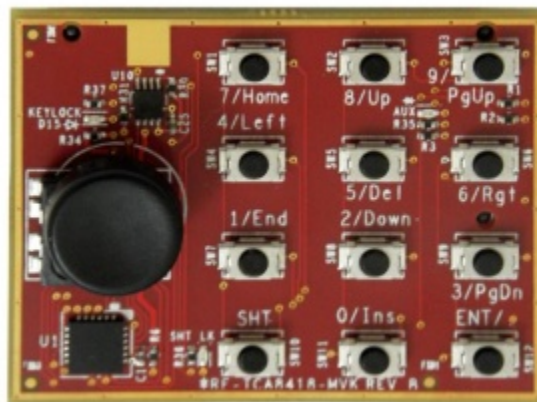


Figure 1. RF-TCA8418-MVK MAVRK Module

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

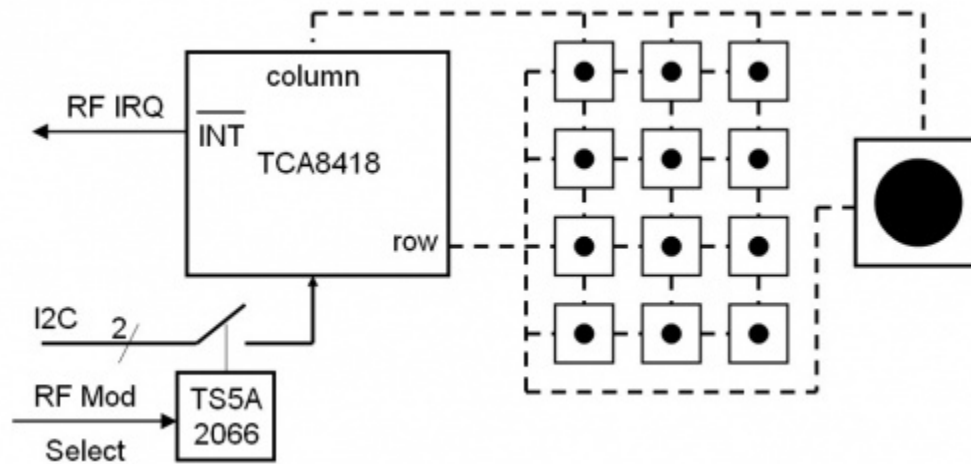


Figure 2. A block diagram of the RF-TCA8418-MVK MAVRK Module

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](#).

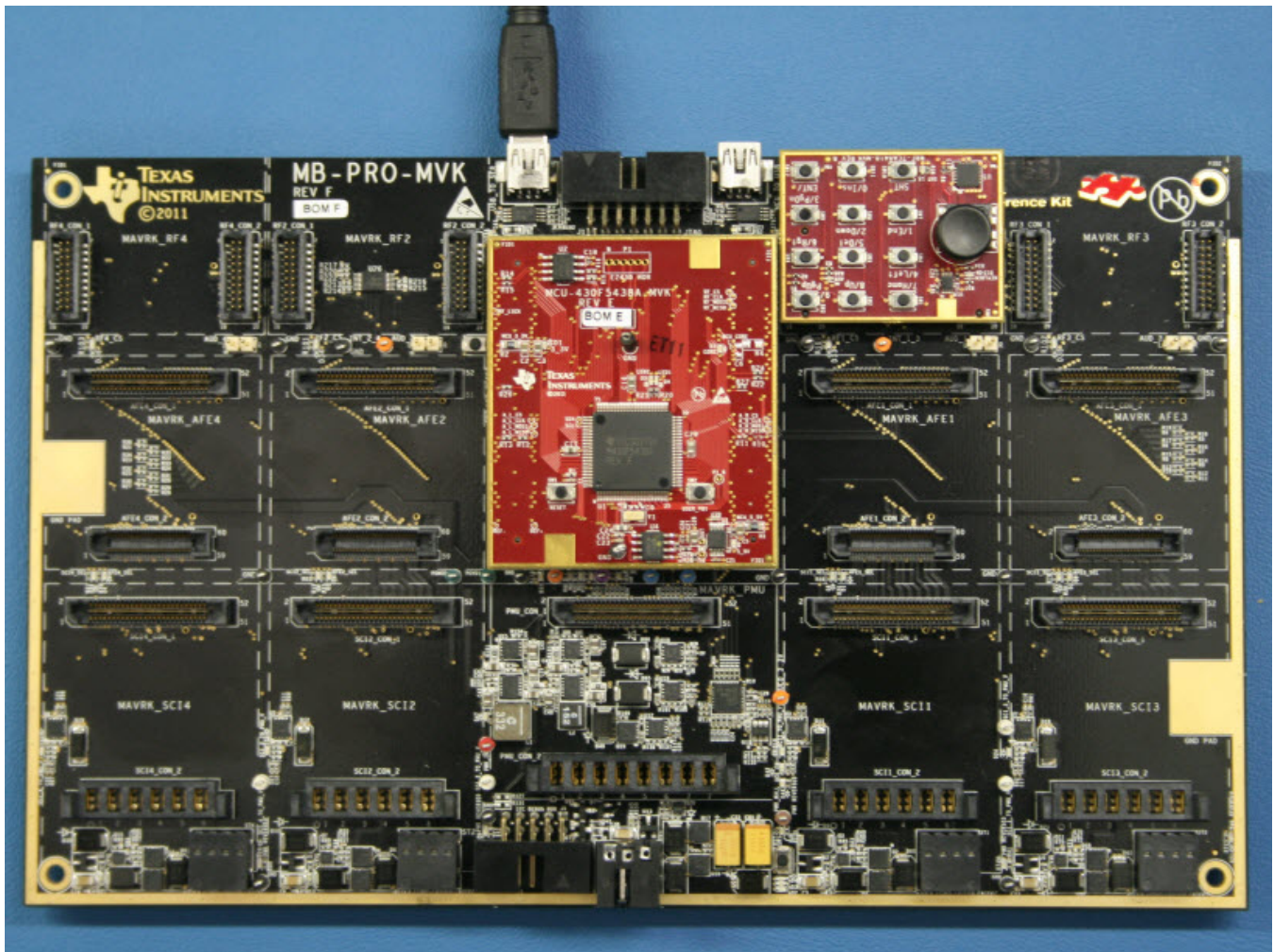


Figure 3. RF-TCA8418-MVK Module on the MAVRK Pro Motherboard

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.

```

TCA8418-MVK_Demo_Main.c
74/*****
75*
76* Definitions
77*****
78#define RIGHT    MAVRK_RF3
79#define LEFT     MAVRK_RF4
80/*****
81*
82* Prototypes
83*****
84*
85* Global Variables
86*****
87// 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
88// and one will be used to receive commands from the PC. Note that we could have re-used a packet for the
89// ACKs in order to save memory.
90
91PC_Interface_Packet_type  PcRcvPacket;
92
93
94
95
96
97
98
99
100
101
    
```

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.

```

TCA8418-MVK_Demo_Main.c
124
125/*****
126/* Initialize TCA8418 Component
127/*****
128// Right is defined in the Definitions section of this file
129mvk_Initialize_Keyboard (RIGHT);
130// For Demo's requiring a second keyboard remove comments on the line below
131mvk_Initialize_Keyboard (LEFT);
132/*****
133/* Use for testing the PC Interface from MAVRK TCA8418 board to a host PC
134/*****
135// mvk_Send_TCA8418_Test_Packet(TCA8418_Packet_Data, TCA8418_DEVICE_SLOT, 1); // send one set of test packets
136
137#ifdef DEBUG
138// This call is necessary to enable any devices using the GPIOs on the AFE slots. It is used in DEBUG mode to light
139mvk_Enable_AFE_Latched_GPIOs (); // Enable the AFE Latched GPIO to start output of data
140#endif
141
142/*****
143*
144* main.c - Background Tasks
145*****
146mvk_UART_Debug_Printf_Flush ("\033[2J", 4);
147mvk_UART_Debug_Printf_Flush ("\r\nTCA8418-MVK Demo\r\n", 20);
148mvk_UART_Debug_Printf_Flush ("\r\nMAVRK packets and terminal messages will be provided for", 58);
149mvk_UART_Debug_Printf_Flush ("\r\nEach press and release of keys.\r\n\r\n", 37);
150
151while (1)
152{
153    idle_count++; // Idle Count is incremented every time
154
155    if (mvk_Is_User_Button_Pushed () )
156    {
157        mvk_Toggle_MCU_LED (MCU_YELLOW);
158        mvk_Clear_User_Button_Status ();
159    }
160
161    // Is there a keypress and TCA8418 data ready to send to the PC?
162    if (TCA8418_DATA_AVAILABLE == mvk_Check_and_Process_Key_Press (RIGHT)) // Send current key events to the PC Int
163    {
164        mvk_Toggle_MCU_LED (MCU_YELLOW);
165        idle_count = 0;
166    }
167}
    
```

Figure 5. TCA8418 RF Slot Definitions 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:

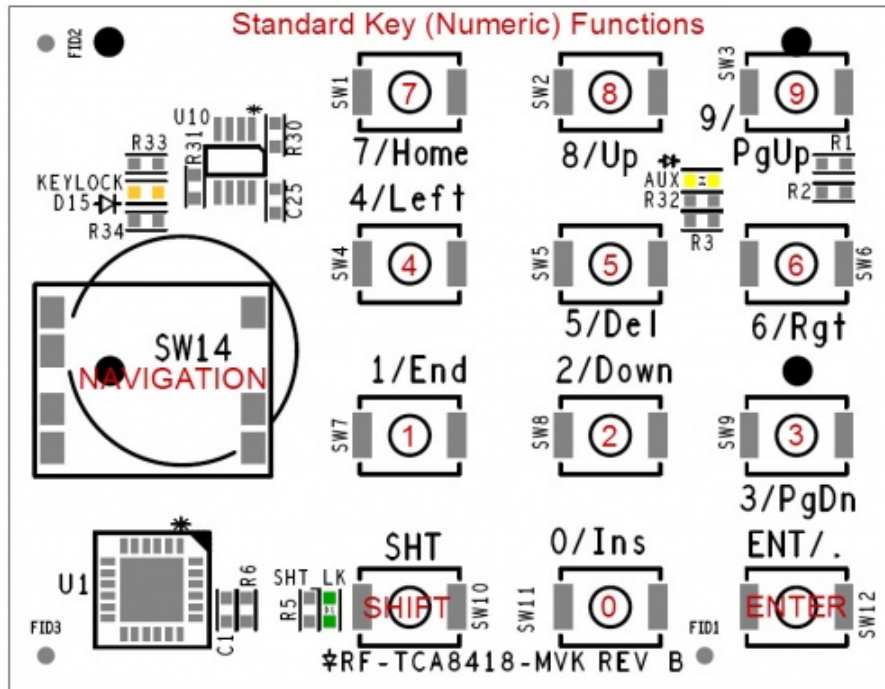


Figure 7. Functions of the keys while SHIFT is disabled

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

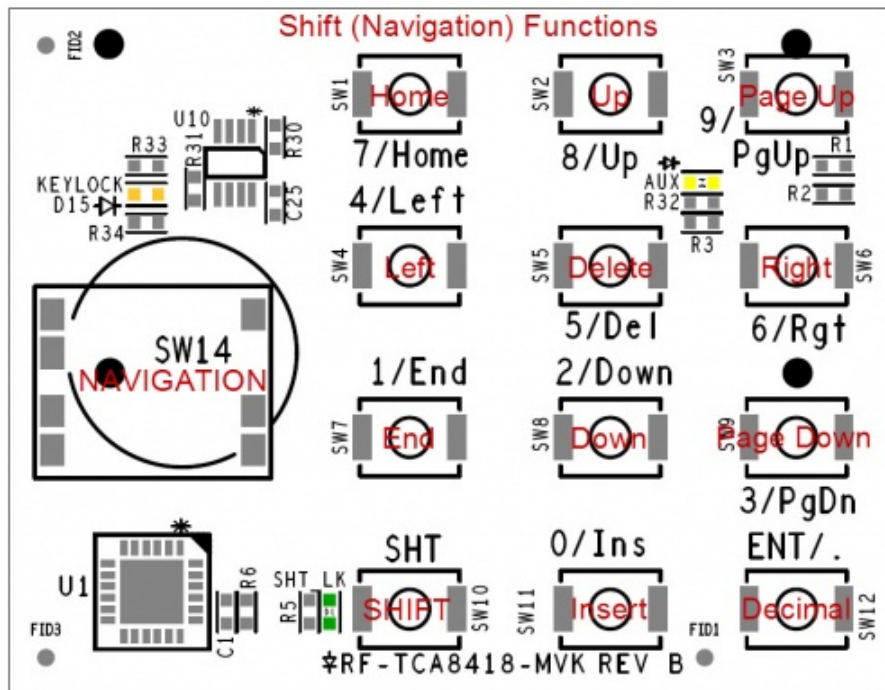


Figure 8. Functions of the keys while SHIFT is enabled

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

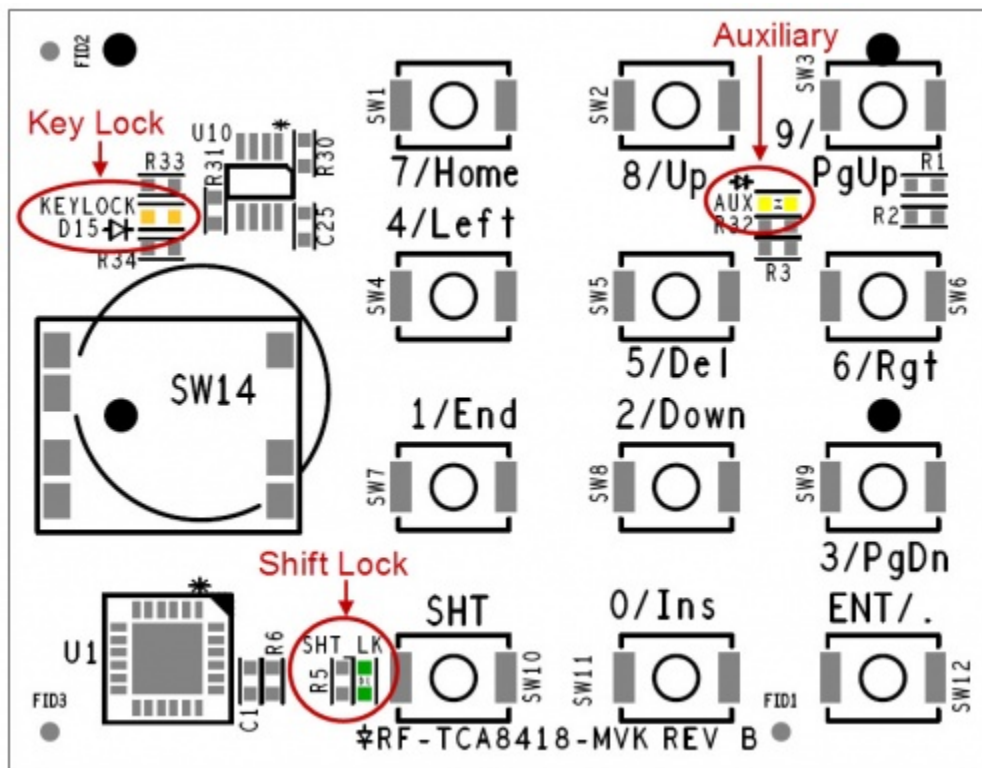


Figure 9. Map of LEDs on the RF-TCA8418-MVK MAVRK Module

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_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:

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.

QTY	REF	DESCRIPTION	MANUFACTURER	PART NUMBER	UNIT PRICE	TOTAL PRICE
1	U10	KEYLOCK		D13		
1	R37	RES				
1	R31	RES				
1	R34	RES				
1	C25	CAP		R30		
1	SW1	SW				
1	SW2	SW				
1	SW3	SW				
1	SW4	SW				
1	SW5	SW				
1	SW6	SW				
1	SW7	SW				
1	SW8	SW				
1	SW9	SW				
1	SW10	SW				
1	SW11	SW				
1	SW12	SW				
1	U1	IC				
1	R36	RES				
1	R35	RES				
1	R3	RES				
1	R2	RES				
1	R1	RES				
1	C1	CAP				

Figure 10. RF-TCA8418-MVK Bill of Materials

4.2 Layout (PDF)

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

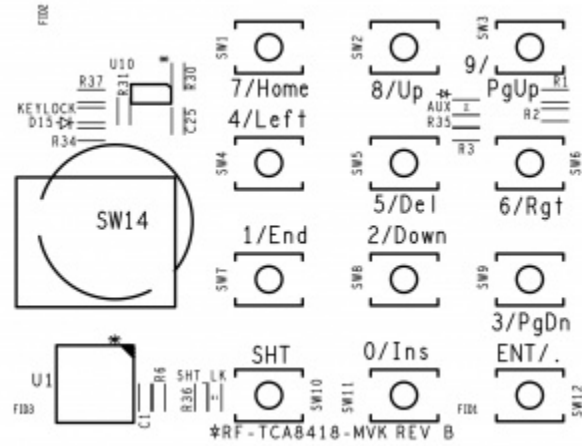


Figure 11. RF-TCA8418-MVK Board Top Silkscreen

4.3 Schematics (PDF)

[Download a PDF](#) of the schematic.

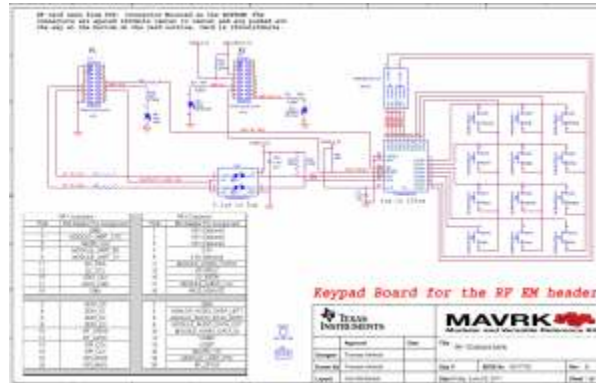


Figure 12. RF-TCA8418-MVK Schematic

4.4 Fabrication Drawings (PDF)

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

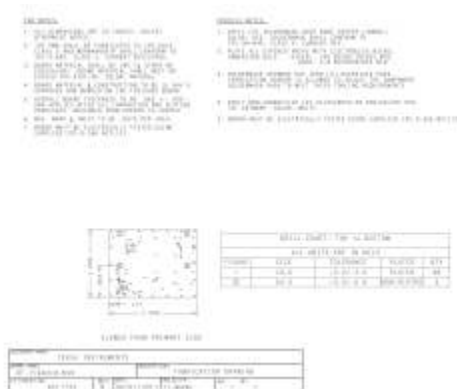


Figure 13. RF-TCA8418-MVK Fabrication Drawing

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*

<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Hardware Design Guide for the uMAVRK Analog Interface • Hardware Design Guide for the uMAVRK Power Interface • Template - Hardware User's Guide
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5.4 *I want more Technical Info on MAVRK Software*

<ul style="list-style-type: none"> • How to Convert a Project from IAR to CCS 	<ul style="list-style-type: none"> • 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 handling, 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](#)

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

[RoHS Compliant Solutions](#)

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

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This Class A or B digital apparatus complies with Canadian ICES-003. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada. Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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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6.5.3 Agreement to Defend, Indemnify and Hold Harmless

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Security	www.ti.com/security
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