TCA8418E Keypad Scan EVM

This user's guide describes the TCA8418E-EVM keypad scan evaluation module (EVM). This guide contains an introduction, setup instructions, the EVM schematic, top and bottom board layouts, and a bill of materials (BOM).

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1 Information About Cautions and Warnings

CAUTION

This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, see the *Electrostatic Discharge (ESD)* application note (SSYA008).

The information in a caution or a warning is provided for your protection. Read each caution and warning carefully.

2 Items Required for Operation

The following items are required to use the TCA8418E-EVM:

- TCA8418E-EVM
- TCA8418E datasheet (SCPS222)
- One power supply for V_{CC}
  - 3.3 V at 100 mA recommended

3 Items Recommended for Operation

The following items are recommended for use with the TCA8418E-EVM:

- MSP430 LaunchPad
  - Recommended rev 1.5
  - MSP430G2553 installed
- USB standard-A to mini-B cable
- Computer running Microsoft® Windows® 7 with 1 available USB port

4 Introduction

This document is the user's guide for the TCA8418E-EVM. The TCA8418E-EVM can be used as a standalone system or paired with the MSP-EXP430G2 LaunchPad to facilitate power and I^2C communication. When paired with the LaunchPad, The TCA8418E-EVM GUI can be used to read from or write to internal registers of the TCA8418E keypad scan IC, allowing the user to control the states of the I/O pins as well as see key presses in real-time.

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Table 1. Device and Package Configurations

Keypad Scan IC	IC	Package
U1	TCA8418EYFFR	DSBGA-32

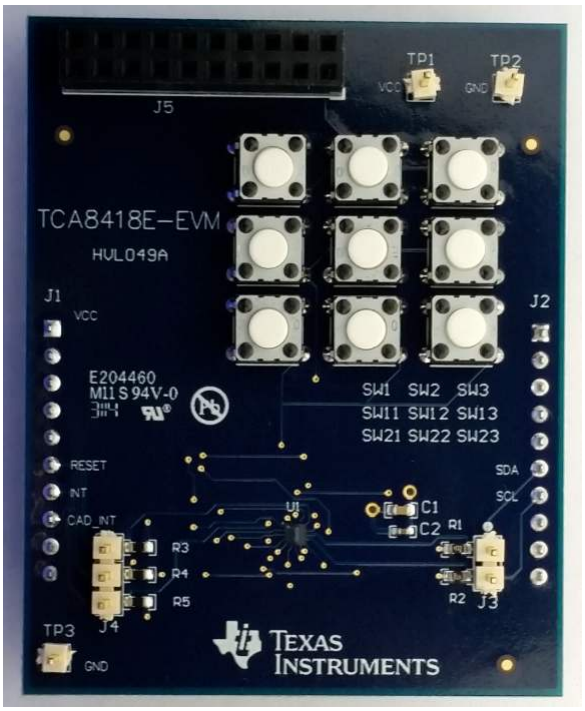

Figure 1. TCA8418E-EVM

5 Setup

This section describes the header/jumper connections on the TCA8418E-EVM, installation of the firmware on the MSP430 LaunchPad, installation of the software (GUI) on the computer, and getting started using the TCA8418E-EVM with any of the supported devices.

5.1 Header/Jumper Connections Description

5.1.1 TP1: Power Input

Test point TP1 allows power input without the LaunchPad. The range is 1.65 V to 3.6 V.

5.1.2 TP2 and TP3: Ground

Test points TP2 and TP3 are connected to ground.

5.1.3 J1 and J2: MSP430 LaunchPad Interface Headers

Headers J1 and J2 are the connectors for the MSP430 LaunchPad to the TCA8418E-EVM.

5.1.4 J3: I^2C Test Points

Header J3 is a test point for SDA and SCL, and allows I^2C input when the LaunchPad is not present.

5.1.5 J4: RESET and Interrupt Test Points

Test point J4 is a test point for the RESET input, INT output, and CAD_INT output.

5.1.6 J5: Keypad Extension Header

Header J5 allows extension of the functionality of the TCA8418E-EVM onto a larger keypad or GPIO expander board.

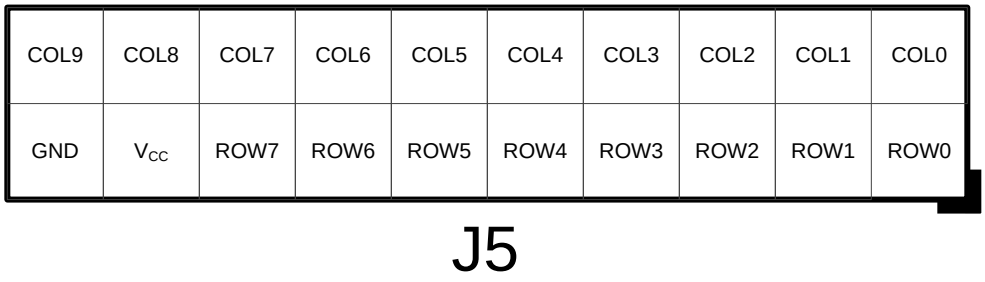

Figure 2. Header J5 Connections to TCA8418E Pins (Top View)

5.1.7 SW1, SW2, SW3, SW11, SW12, SW13, SW21, SW22, SW23: Keypad Switches

These switches are named in accordance with the Key Value Assignment table in the TCA8418E (SCPS222) datasheet. They are for ROW0-ROW2 and COL0-COL2, which are programmed as keypad I/Os, by default, on the TCA8418E-EVM.

5.2 LaunchPad Hardware/Firmware Setup

If using the TCA8418E-EVM GUI, the MSP430 LaunchPad board needs to be configured properly in order to flash the processor with the TCA8418E-EVM firmware. Implement the following steps before using the TCA8418E-EVM in conjunction with the LaunchPad:

1. With the LaunchPad unplugged, configure the headers on the LaunchPad to be in HW UART mode by attaching jumpers on the headers indicated by the yellow boxes in Figure 3.

Figure 3. Proper Jumper Configuration on the LaunchPad

2. Place the TCA8418E-EVM on top of the LaunchPad so that all connectors on J1 and J2 of the LaunchPad are inserted into J1 and J2 of the TCA8418E-EVM and J7 on the TCA8418E-EVM is on the same side as the mini-USB connector of the LaunchPad.

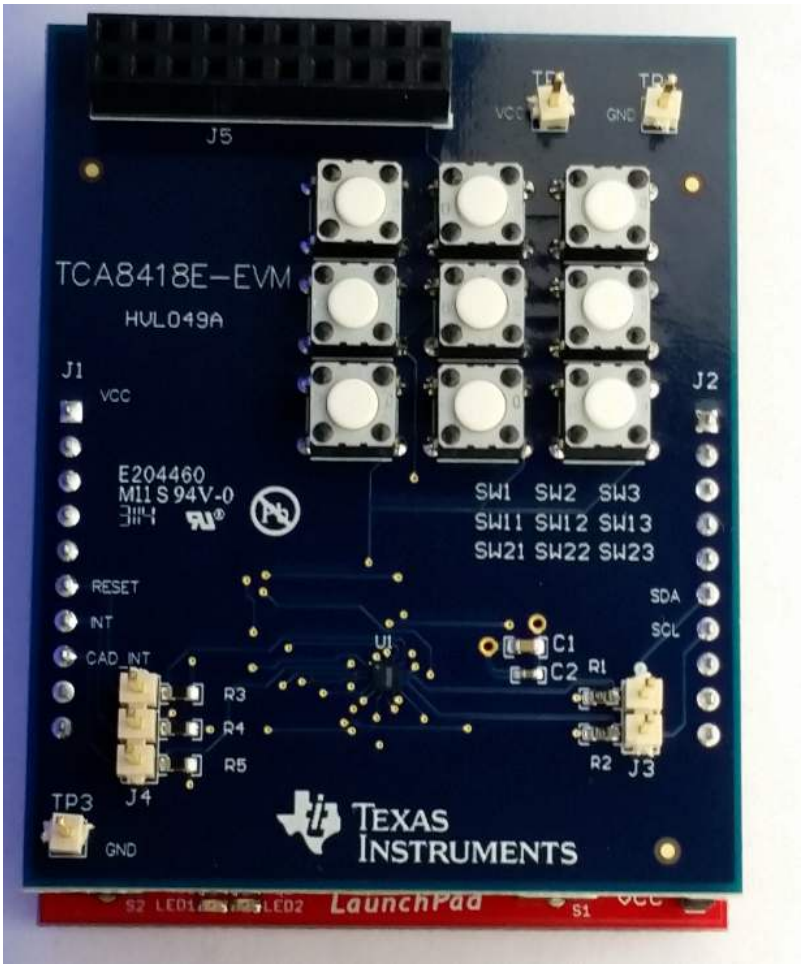

Figure 4. Proper Orientation for the TCA8418E-EVM on the LaunchPad.

3. Download the firmware (for the MSP430) and software (graphical user interface, or GUI) in a zipped folder (SLVC601) located on the TCA8418E-EVM webpage on ti.com.
4. Right-click on the zip folder and select *Extract All*.
5. Click *Extract*.
6. Plug in the MSP430 LaunchPad to the computer.
7. Open *Device Manager* (Type “devmgmt.msc” into the *Start* menu and hit *Enter*):

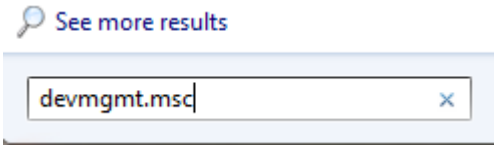

Figure 5. Opening Device Manager in Windows

8. Select the MSP430 Application (see Figure 6), right click → Properties, and click *Update Driver Software*. The MSP430 Application may appear either in *Ports* or *Other Devices*.

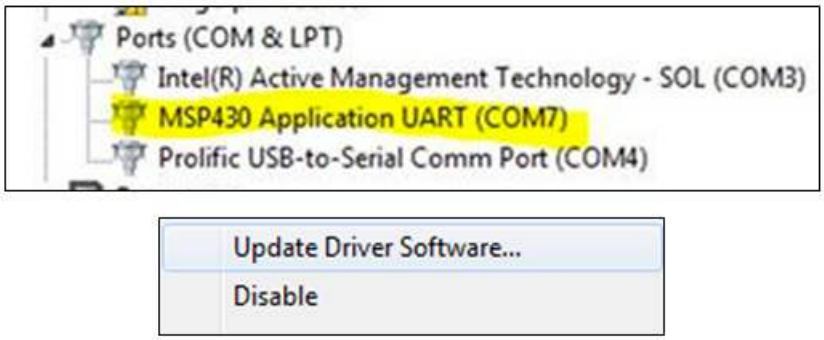

Figure 6. Updating Driver Software in Device Manager

9. Select *Browse my computer*.

Figure 7. Browsing for the Driver Software

10. Select the folder where you extracted [SLVC601].zip.
11. Click *Next*. Click *Close* after you see the following:

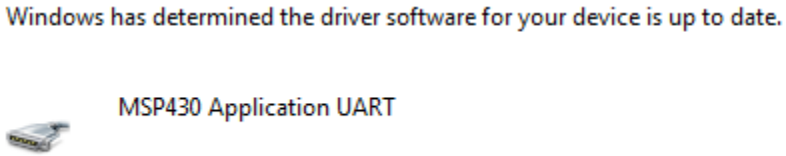

Figure 8. Successful Installation of the MSP430 LaunchPad Drivers

12. Flash the MSP430 by double-clicking *TCA8418E_Flasher.bat* in the TCA8418E-EVM LaunchPad Files folder where you extracted [SLVC601].zip.

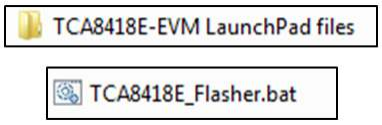

Figure 9. Flashing the MSP430

13. Verify that the command window says “no errors” and then press any key to close the window. A successful flash of the firmware results in the following command line prompt:

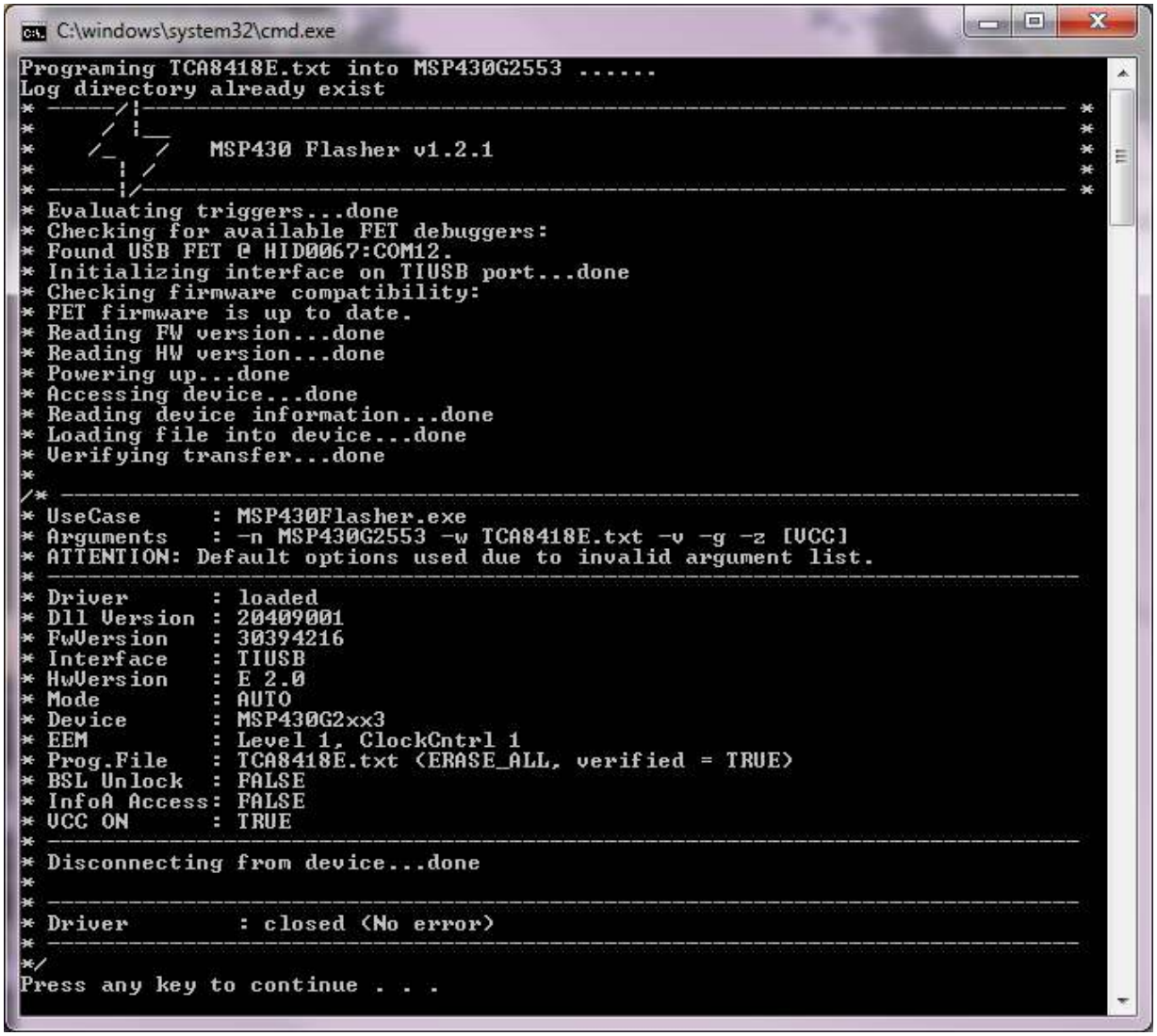

Figure 10. Successfully Flashed MSP430

14. Press any key to continue.

5.3 GUI Software Setup

1. Run *setup.exe,* located in the TCA8418E_GUI folder. From now on, the TCA8418E software is available under the *Start* menu in Programs → Texas Instruments, Inc → TCA8418E.exe.

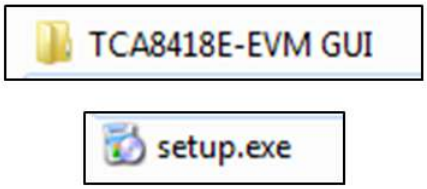

Figure 11. Installing the TCA8418E-EVM GUI

2. If the GUI does not launch automatically, run the installed *TCA8418E-EVM GUI* program from the *Start* menu.
3. The GUI looks like the following image when it is opened and the LaunchPad is connected:

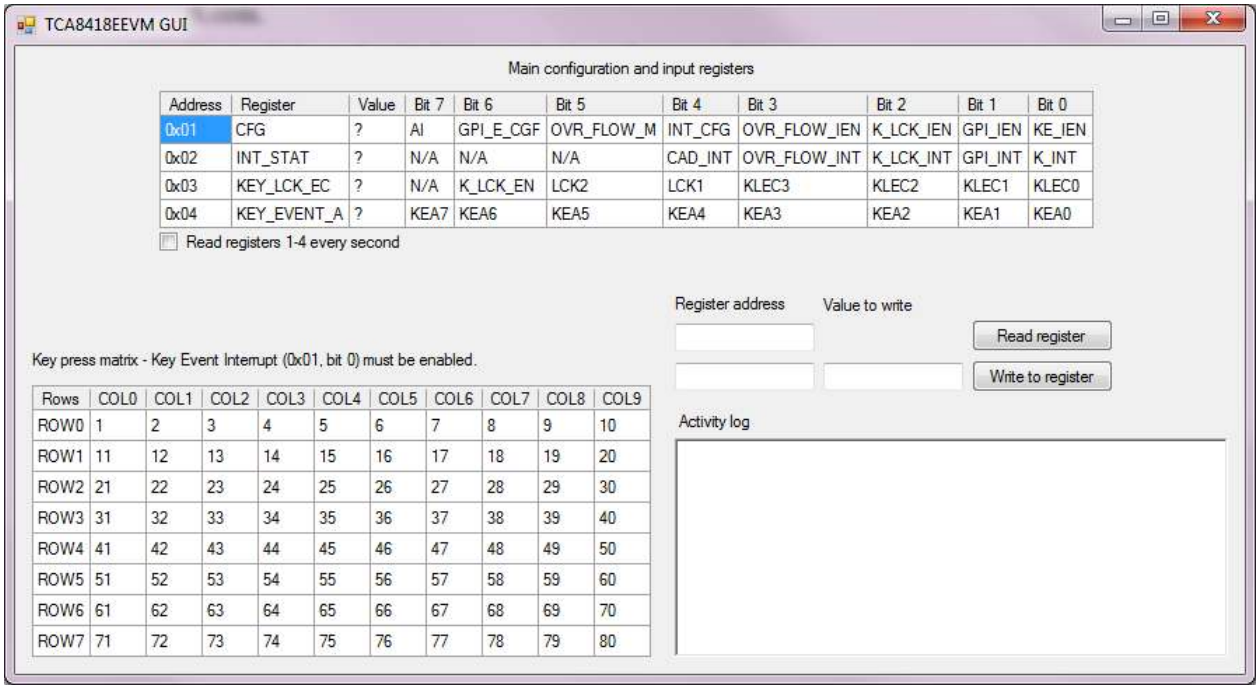

Figure 12. TCA8418E-EVM GUI After Connecting the LaunchPad to the Computer

5.4 Default Register Settings in the TCA8418E when Using the LaunchPad

Upon startup, the MSP430 LaunchPad configures the TCA8418E to work as a keypad scanner with the following values:

Table 2. Default TCA8418E Register Values When Using the LaunchPad

Register	Register Name	Default Value for EVM	Comment
0x00	Reserved	0x97	Interrupts enabled (except Overflow)
0x01	CFG	0x00	
0x02	INT_STAT	0x00	
0x03	KEY_LCK_EC	0x00	
0x04	KEY_EVENT_A	0x00	
0x05	KEY_EVENT_B	0x00	
0x06	KEY_EVENT_C	0x00	
0x07	KEY_EVENT_D	0x00	
0x08	KEY_EVENT_E	0x00	
0x09	KEY_EVENT_F	0x00	
0x0A	KEY_EVENT_G	0x00	
0x0B	KEY_EVENT_H	0x00	
0x0C	KEY_EVENT_I	0x00	
0x0D	KEY_EVENT_J	0x00	
0x0E	KP_LCK_TIMER	0xA7	
0x0F	Unlock1	0x0C	Key #12
0x10	Unlock2	0x0C	Key #12 – Press twice to unlock
0x11	GPIO_INT_STAT1	0x00	
0x12	GPIO_INT_STAT2	0x00	
0x13	GPIO_INT_STAT3	0x00	
0x14	GPIO_DAT_STAT1	0xFF	
0x15	GPIO_DAT_STAT2	0xFF	
0x16	GPIO_DAT_STAT3	0x03	
0x17	GPIO_DAT_OUT1	0x00	
0x18	GPIO_DAT_OUT2	0x00	
0x19	GPIO_DAT_OUT3	0x00	
0x1A	GPIO_INT_EN1	0x00	
0x1B	GPIO_INT_EN2	0x00	
0x1C	GPIO_INT_EN3	0x00	
0x1D	KP_GPIO1	0xFF	ROW0 through ROW7: keypad scan
0x1E	KP_GPIO2	0xFF	COL0 through COL7: keypad scan
0x1F	KP_GPIO3	0x00	
0x20	GPI_EM1	0x00	
0x21	GPI_EM2	0x00	
0x22	GPI_EM3	0x00	
0x23	GPIO_DIR1	0x00	
0x24	GPIO_DIR2	0x00	
0x25	GPIO_DIR3	0x00	
0x26	GPIO_INT_LVL_1	0x00	
0x27	GPIO_INT_LVL_2	0x00	
0x28	GPIO_INT_LVL_3	0x00	
0x29	DEBOUNCE_DIS_1	0x00	
0x2A	DEBOUNCE_DIS_2	0x00	
0x2B	DEBOUNCE_DIS_3	0x00	

Table 2. Default TCA8418E Register Values When Using the LaunchPad (continued)

Register	Register Name	Default Value for EVM	Comment
0x2C	GPIO_PULL1	0x00	
0x2D	GPIO_PULL2	0x00	
0x2E	GPIO_PULL3	0x00	

5.5 Getting Started Using the TCA8418E-EVM

5.5.1 Evaluating the TCA8418E EVM without the LaunchPad

1. To power the TCA8418E-EVM without the LaunchPad, apply a 3.3-V, 100-mA power supply to TP1 (VCC pin). Although 3.3 V is preferred, the voltage range can be from 1.65 V to 3.6 V.
2. Attach an external microcontroller to J3 to provide SCL and SDA inputs for I^2C. Keep in mind that SCL and SDA are pulled up to VCC on the TCA8418E-EVM through 4.7-kΩ resistors. Therefore, using the same power supply for the microcontroller and the TCA8418E-EVM is recommended.
3. Use the built-in 3x3 keypad on the TCA8418E-EVM or use J5 to attach an external keypad. If attaching an external keypad, the KP_GPIO registers (0x1D, 0x1E, and 0x1F) should be configured to accommodate the additional keys.

5.5.2 Evaluating the TCA8418E EVM with the LaunchPad

After completing the steps in Section 5.2, launch the TCA8418E-EVM software. The screen will look like Figure 13.

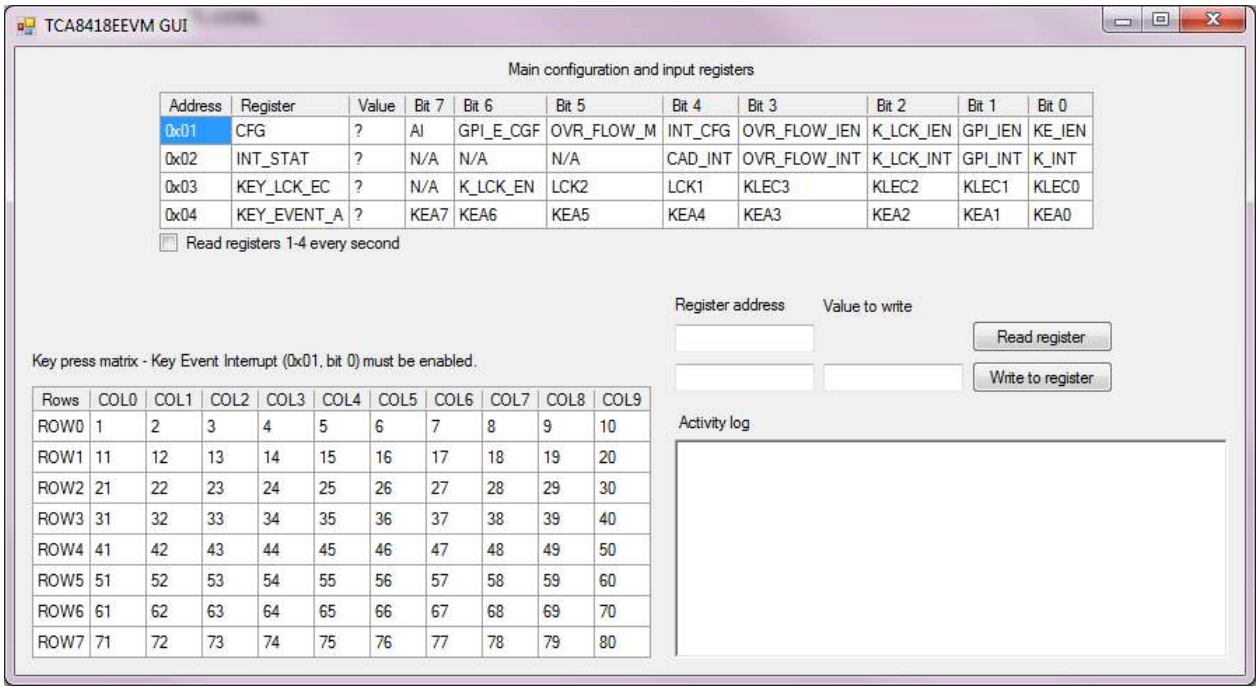

Figure 13. TCA8418E-EVM GUI After Connecting the LaunchPad to the Computer

5.5.2.1 Using the Key Press Matrix Display

Connect the TCA8418E-EVM and launch the GUI. The key press matrix display will only work when KE_IEN (0x01, bit 0) is set to 1. By default, key event interrupts are enabled because KE_IEN (0x01, bit 0) is set to 1 and the key press matrix display responds in real-time to key presses and releases. Press the middle button (SW12) on the TCA8418E-EVM and observe the feedback from the display (Figure 14).

Rows	COL0	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9
ROW0	1	2	3	4	5	6	7	8	9	10
ROW1	11	12	13	14	15	16	17	18	19	20
ROW2	21	22	23	24	25	26	27	28	29	30
ROW3	31	32	33	34	35	36	37	38	39	40
ROW4	41	42	43	44	45	46	47	48	49	50
ROW5	51	52	53	54	55	56	57	58	59	60
ROW6	61	62	63	64	65	66	67	68	69	70
ROW7	71	72	73	74	75	76	77	78	79	80

Figure 14. Key Press Matrix Display While Holding Down the Middle Button (SW12)

Releasing the key causes the grey box to become white again.

5.5.2.2 Main Configuration and Input Registers

Main configuration and input registers

Address	Register	Value	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x01	CFG	?	AI	GPI_E_CGF	OVR_FLOW_M	INT_CFG	OVR_FLOW_IEN	K_LCK_IEN	GPI_IEN	KE_IEN
0x02	INT_STAT	?	N/A	N/A	N/A	CAD_INT	OVR_FLOW_INT	K_LCK_INT	GPI_INT	K_INT
0x03	KEY_LCK_EC	?	N/A	K_LCK_EN	LCK2	LCK1	KLEC3	KLEC2	KLEC1	KLEC0
0x04	KEY_EVENT_A	?	KEA7	KEA6	KEA5	KEA4	KEA3	KEA2	KEA1	KEA0

☐ Read registers 1-4 every second

Figure 15. Main Configuration and Input Register Display

The main configuration and input registers are the registers most likely to change while operating the TCA8418E-EVM. For this reason, they are more prominent on the GUI.

The CFG register contains the interrupt enable bits for different types of interrupts.

The INT_STAT register contains the actual state of each type of interrupt.

The KEY_LCK_EC contains the lock status, can be written to lock the keypad, and counts the number of key events (in the 4 least significant bits).

KEY_EVENT_A is the top of the first-in first-out (FIFO) stack that records key presses and releases. KEY_EVENT_A is read automatically when KE_IEN = 1 and a key has been pressed or released.

Whenever one of these four registers is read, the main configuration and input register display updates to show the newly read value of those registers.

The *Read registers 1-4 every second* checkbox causes the TCA8418E-EVM GUI to start a timer that will read registers 1 through 4 every second. The read takes 100 ms. This feature shows how KEY_EVENT_A and KEY_LCK_EC change every time the registers are read. Disable the KE_IEN bit before checking this box; otherwise, nothing appears to occur in registers 3 and 4.

5.5.2.3 Reading and Writing Registers

All registers in the TCA8418E can be read using the TCA8418E-EVM GUI. Figure 16 shows how to read register 0x0E:

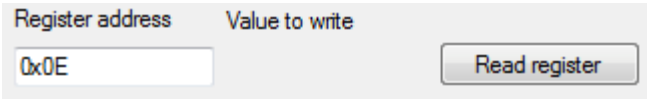

Figure 16. Reading Register 0x0E

Click the *Read Register* button and the following appears in the activity log text (Figure 17):

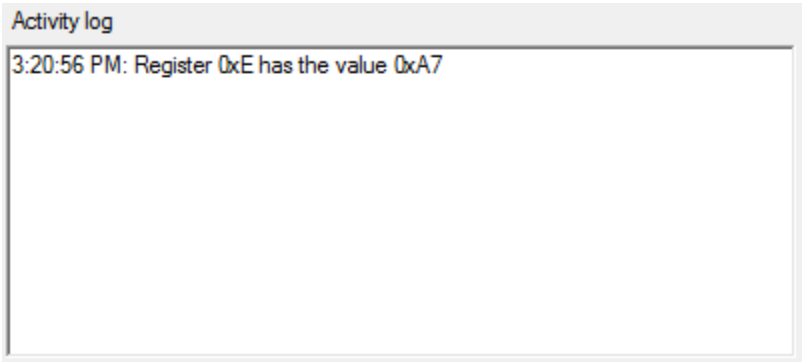

Figure 17. Result of Reading Register 0x0E

Similarly, any register can be written as well. Figure 18 shows how to write 0xA6 to register 0x0E:

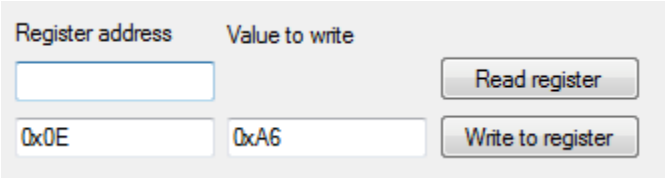

Figure 18. Writing 0xA6 to Register 0x0E

The activity log reflects the newly written register:

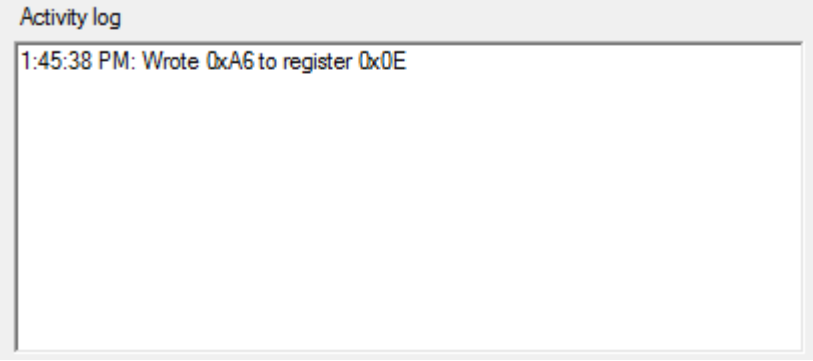

Figure 19. Result of Writing 0xA6 to Register 0x0E

6 Schematic

Figure 20 shows the schematic for the TCA8418E-EVM.

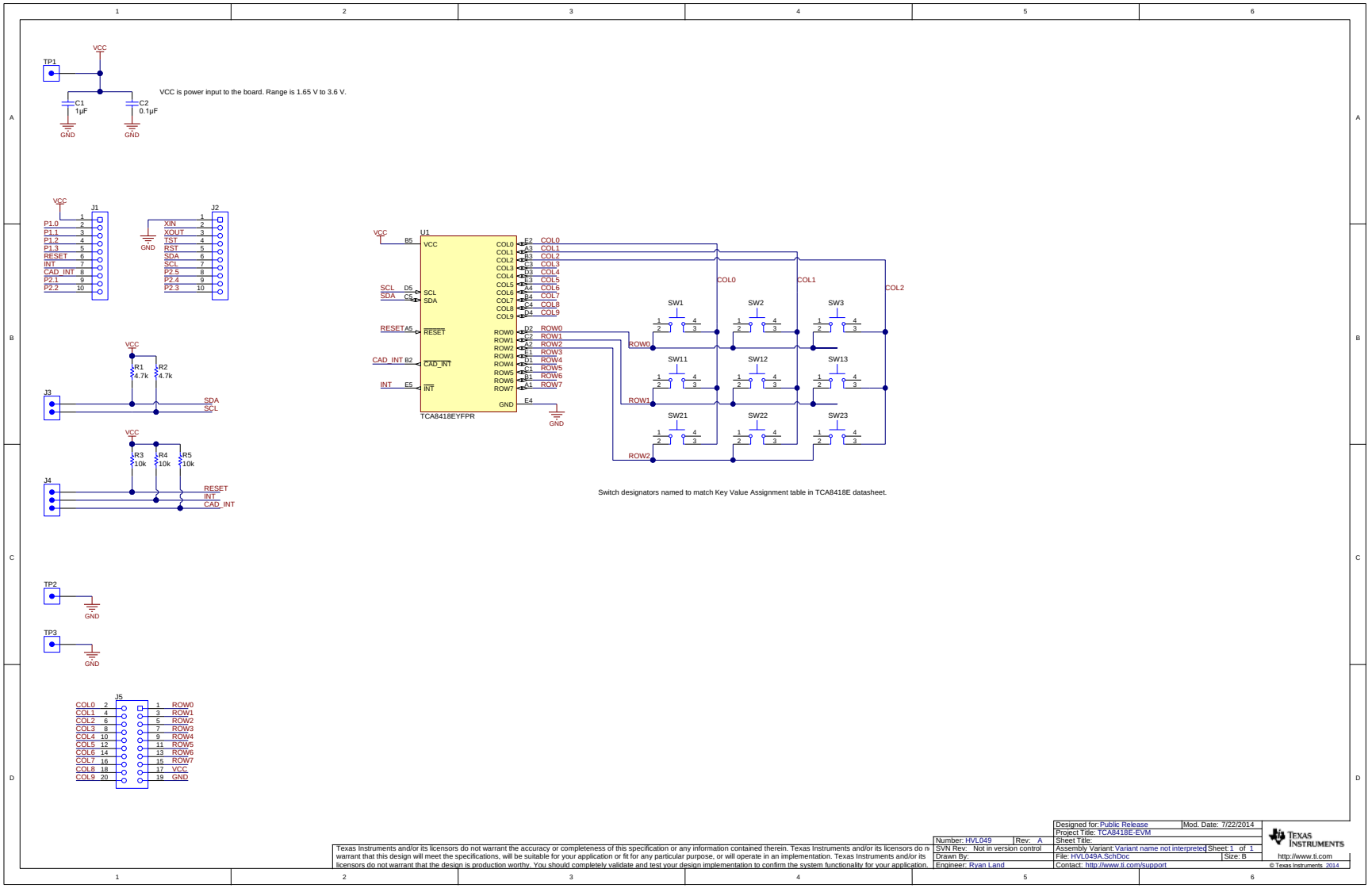

Figure 20. TCA8418E-EVM Schematic

7 Board Layout

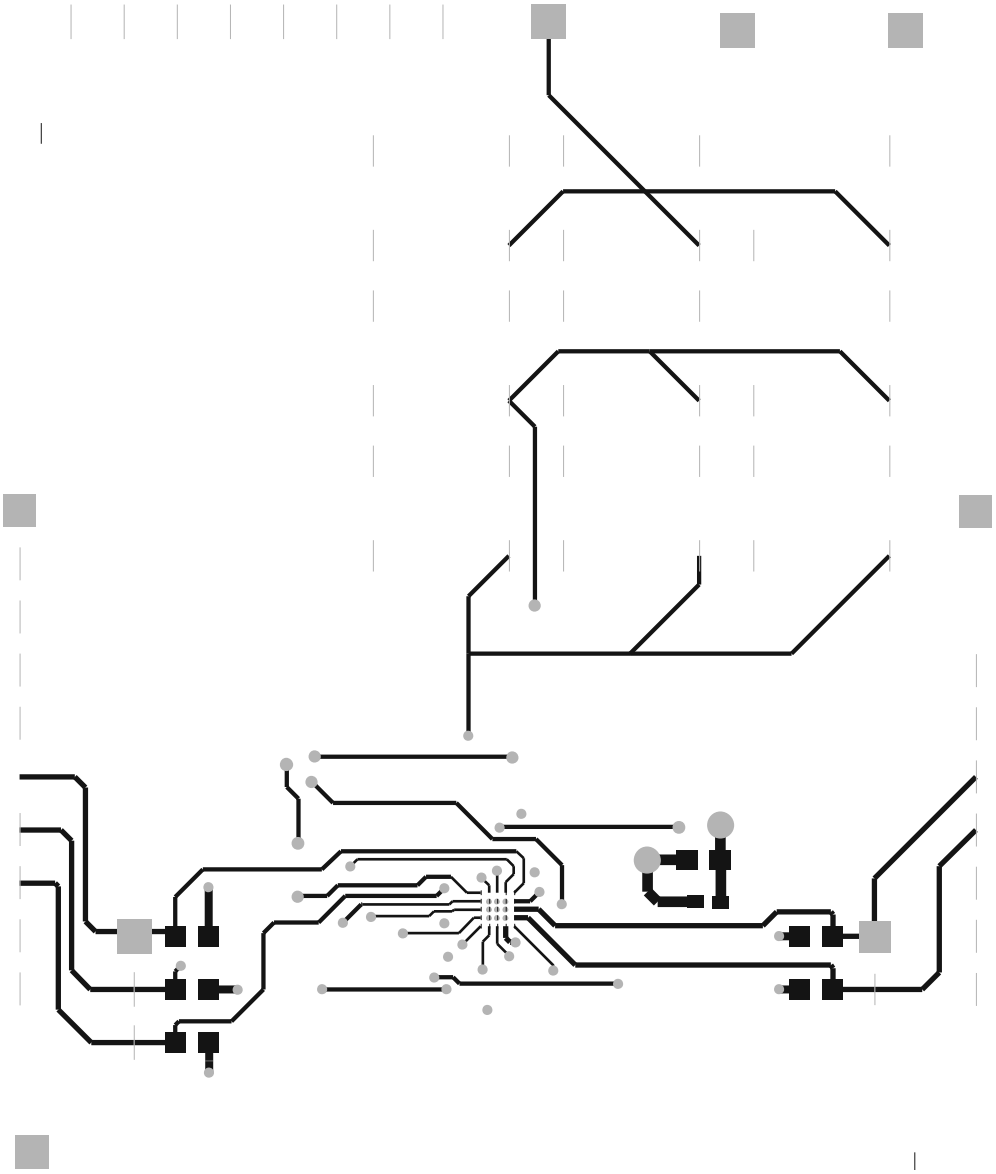

Figure 21. PCB Layer 1 (Top Layer)

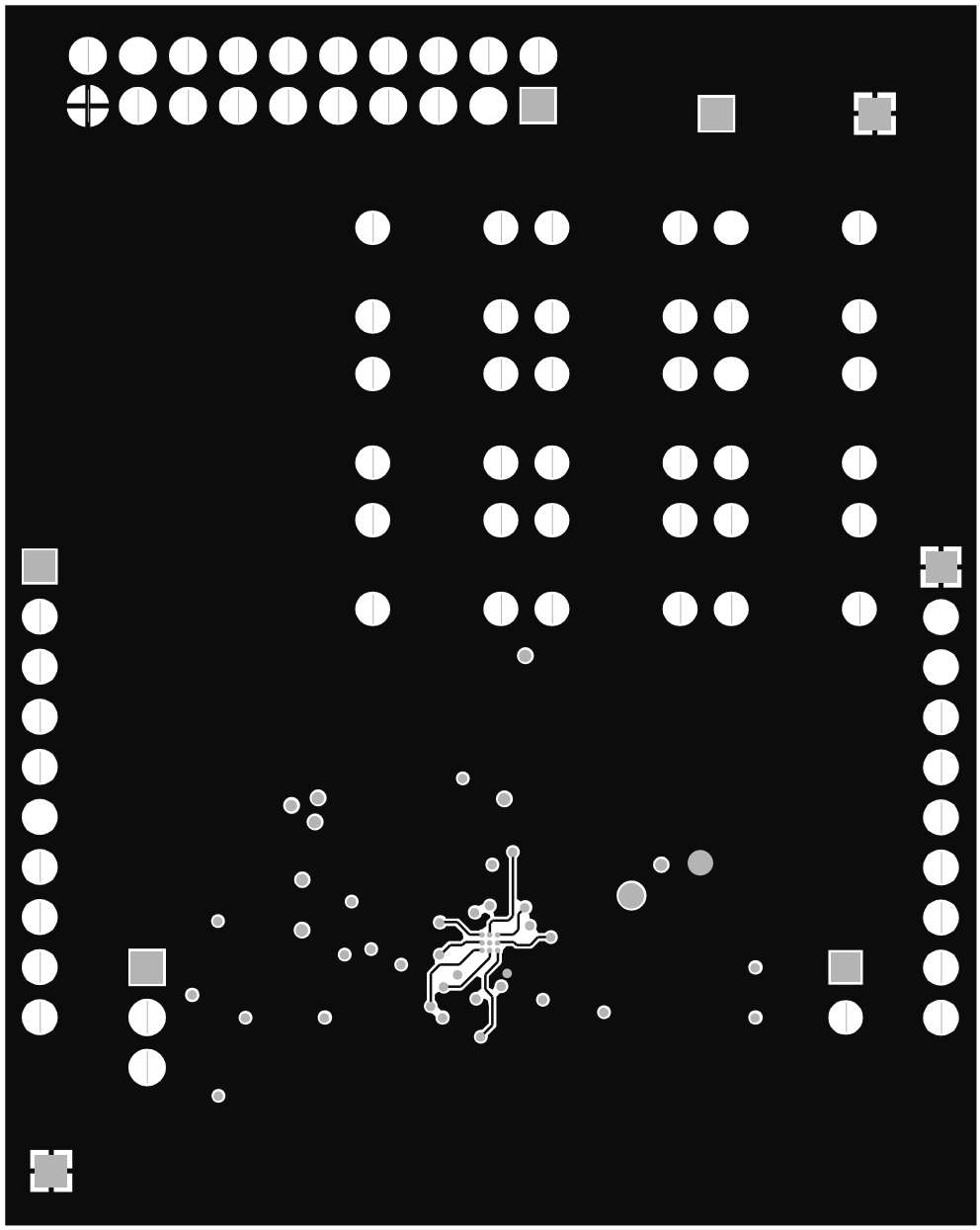

Figure 22. PCB Layer 2 (GND)

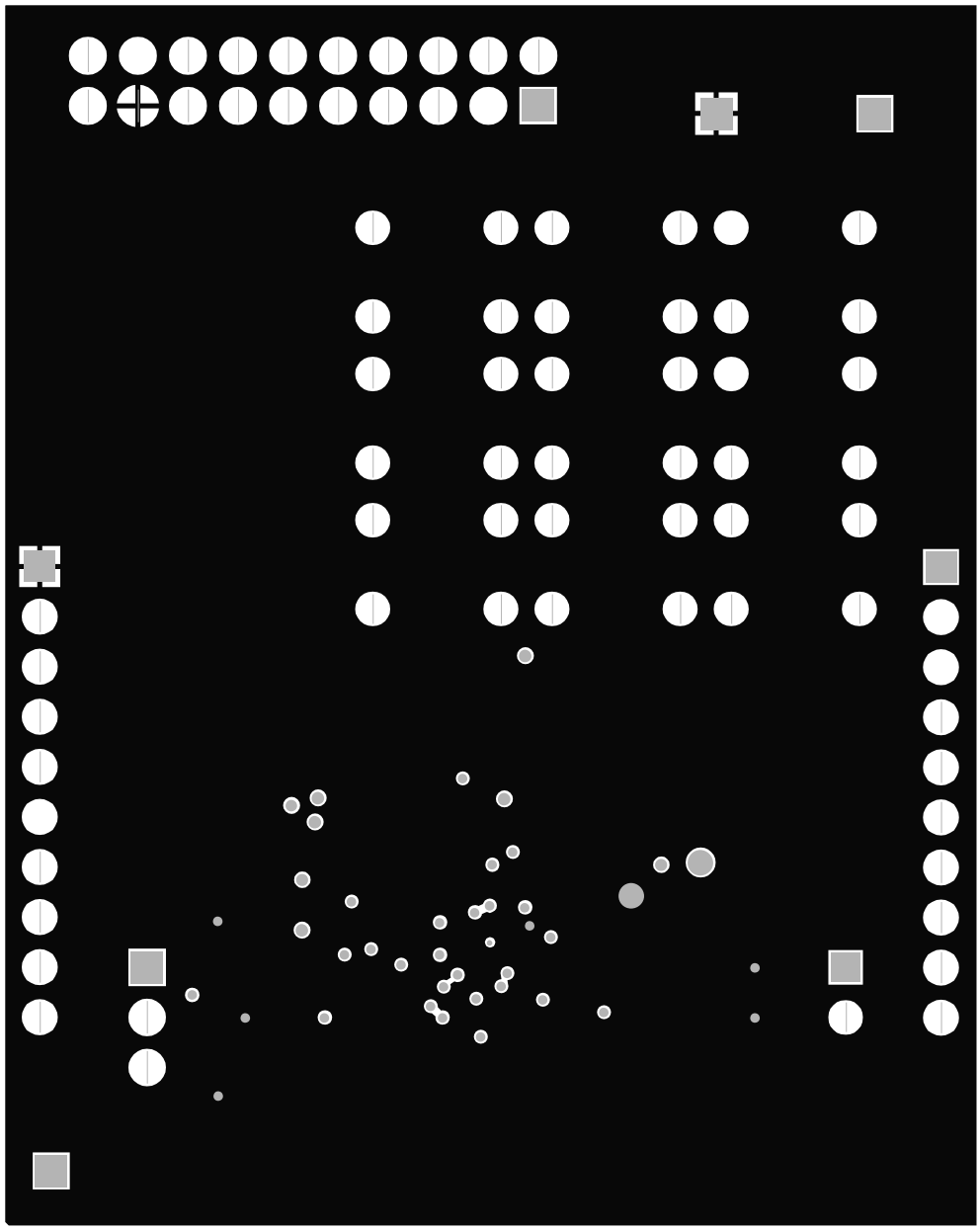

Figure 23. PCB Layer 3 (VCC)

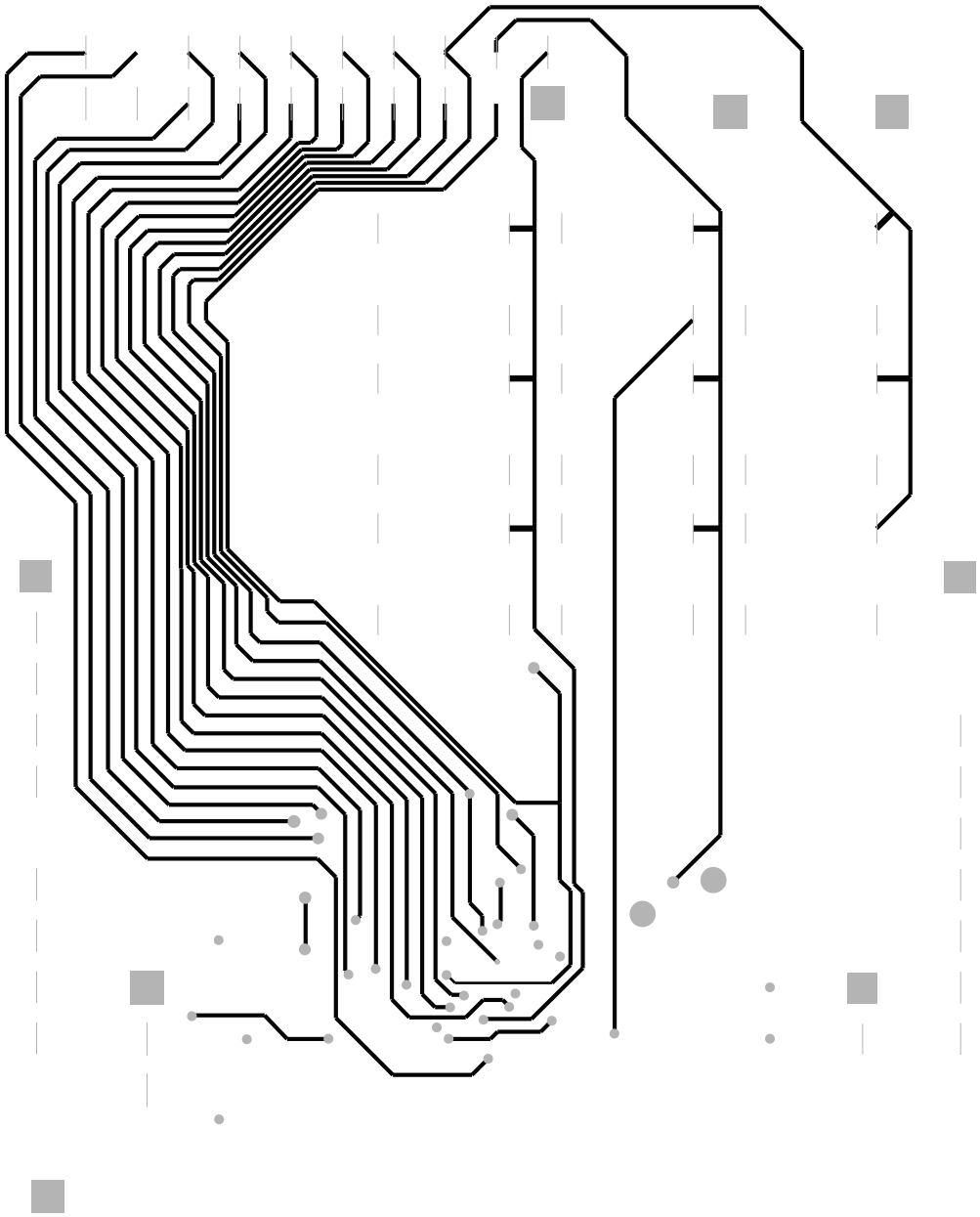

Figure 24. PCB Layer 4 (Bottom Layer)

8 Bill of Materials

Table 3 lists the BOM for this EVM.

Table 3. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
C1	1	1µF	CAP, CERM, 1µF, 16V, ±10%, X5R, 0603	603	GRM188R61C105KA93D	Murata
C2	1	0.1µF	CAP, CERM, 0.1µF, 16V, ±10%, X7R, 0402	402	GRM155R71C104KA88D	Murata
J1, J2	2		Receptacle 100mil 10x1, Tin, TH	Receptacle, 10x1, 100mil, Tin	PPTC101LFBN-RC	Sullins Connector Solutions
J3	1		Header, 100mil, 2x1, Gold plated, TH	Header, 2x1, 100mil	5-146261-1	TE Connectivity
J4	1	1x3	Header, TH, 100mil, 1x3, Gold plated, 230 mil above insulator	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions
J5	1		Receptacle, 10x2, 100mil, TH	10x2 Receptacle	PPPC102LFBN-RC	Sullins Connector Solutions
LBL1	1		Thermal Transfer Printable Labels, 1.250" W x 0.250" H - 10,000 per roll	PCB Label 1.25"H x 0.250"W	THT-13-457-10	Brady
R1, R2	2	4.7k	RES, 4.7kΩ, 5%, 0.1W, 0603	603	CRCW06034K70JNEA	Vishay-Dale
R3, R4, R5	3	10k	RES, 10kΩ, 5%, 0.1W, 0603	603	CRCW060310K0JNEA	Vishay-Dale
SW1–SW3, SW11–SW13, SW21–SW23	9		SWITCH TACTILE SPST-NO 0.02A 15V, TH	6x4.3x6mm	EVQ-PAD04M	Panasonic
TP1, TP2, TP3	3		Header, 100mil, 1pos, Gold, TH	Testpoint	TSW-101-07-G-S	Samtec
U1	1		I2C CONTROLLED KEYPAD SCAN IC WITH INTEGRATED ESD PROTECTION, YFP0025ABAB	YFP0025ABAB	TCA8418EYFPR	Texas Instruments

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6. User assumes all responsibility, obligation, and any corresponding liability for proper and safe handling and use of EVMs.
7. Should any EVM not meet the specifications indicated in the user's guide or other documentation accompanying such EVM, the EVM may be returned to TI within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY TI TO USER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. TI SHALL NOT BE LIABLE TO USER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RELATED TO THE HANDLING OR USE OF ANY EVM.
8. 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 EVMs might be or are used. TI currently deals with a variety of customers, and therefore TI's 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 with respect to the handling or use of EVMs.
9. User assumes sole responsibility to determine whether EVMs may be subject to any applicable federal, state, or local laws and regulatory requirements (including but not limited to U.S. Food and Drug Administration regulations, if applicable) related to its handling and use of EVMs and, if applicable, compliance in all respects with such laws and regulations.
10. User has sole responsibility to ensure the safety of any activities to be conducted by it and its employees, affiliates, contractors or designees, with respect to handling and using EVMs. Further, user is responsible to ensure that any interfaces (electronic and/or mechanical) between EVMs 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.
11. User shall employ reasonable safeguards to ensure that user's use of EVMs will not result in any property damage, injury or death, even if EVMs should fail to perform as described or expected.
12. User shall be solely responsible for proper disposal and recycling of EVMs consistent with all applicable federal, state, and local requirements.

Certain Instructions. User shall operate EVMs within TI's recommended specifications and environmental considerations per the user's guide, accompanying documentation, and any other applicable requirements. Exceeding the specified ratings (including but not limited to input and output voltage, current, power, and environmental ranges) for EVMs may cause property damage, personal injury or death. If there are questions concerning these ratings, user should 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 applicable 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 EVMs' schematics located in the applicable EVM user's guide. When placing measurement probes near EVMs during normal operation, please be aware that EVMs may become very warm. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use EVMs.

Agreement to Defend, Indemnify and Hold Harmless. User agrees to defend, indemnify, and hold TI, its directors, officers, employees, agents, representatives, affiliates, licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of, or in connection with, any handling and/or use of EVMs. User's indemnity shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if EVMs fail to perform as described or expected.

Safety-Critical or Life-Critical Applications. If user intends to use EVMs in evaluations of safety critical applications (such as life support), and a failure of a TI product considered for purchase by user for use in user's product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification, then user must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

RADIO FREQUENCY REGULATORY COMPLIANCE INFORMATION FOR EVALUATION MODULES

Texas Instruments Incorporated (TI) evaluation boards, kits, and/or modules (EVMs) and/or accompanying hardware that is marketed, sold, or loaned to users may or may not be subject to radio frequency regulations in specific countries.

General Statement for EVMs Not Including a Radio

For EVMs not including a radio and not subject to the U.S. Federal Communications Commission (FCC) or Industry Canada (IC) regulations, TI intends EVMs to be used only for engineering development, demonstration, or evaluation purposes. EVMs are not finished products typically fit for general consumer use. EVMs may nonetheless generate, use, or radiate radio frequency energy, but have not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or the ICES-003 rules. Operation of such EVMs 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.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

U.S. Federal Communications Commission Compliance

For EVMs Annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device 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 could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at its own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada Compliance (English)

For EVMs Annotated as IC – INDUSTRY CANADA Compliant:

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.

Concerning EVMs Including Radio Transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs Including Detachable Antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Canada Industry Canada Compliance (French)

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.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

Important Notice for Users of EVMs Considered "Radio Frequency Products" in Japan

EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If user uses EVMs in Japan, user is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after user obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after user obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless user gives the same notice above to the transferee. Please note that if user does not follow the instructions above, user will be subject to penalties of Radio Law of Japan.

http://www.tij.co.jp

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In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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