Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

19-6304; Rev 0; 5/12

MAX5825A Evaluation Kit

Evaluates: MAX5823/MAX5824/ MAX5825A/MAX5825B

General Description

The MAX5825A evaluation kit (EV kit) demonstrates the MAX5825A 12-bit, 8-channel, low-power DAC with selectable internal references and buffered voltage output. The IC comes in a 20-pin TSSOP package. The EV kit provides control to change the DAC's outputs, power operations, references, and watchdog timer settings.

The IC features a watchdog function that can be enabled to monitor the I/O interface for activity and integrity.

The EV kit includes a USB-to-I²C 400kHz interface circuit. The EV kit features Windows XP®-, Windows Vista®-, and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the IC's features.

The EV kit comes with the MAX5825AAUP+ installed, which is the 12-bit I²C version. Contact the factory for samples of the pin-compatible MAX5823AUP+ (8-bit), MAX5824AUP+ (10-bit), and MAX5825BAUP+ (12-bit) versions.

***Ordering Information** appears at end of data sheet.*

Features

- **Wide Input Supply Range: 2.7V to 5.5V**
- **Independent Voltage for Digital I/O: 1.8V to 5.5V**
- **Demonstrates 4.4µs (typ) Settling Time of Buffered Output**
- **Precision Selectable Internal References Supporting 2.048V, 2.500V, and 4.096V**
- **Demonstrates User-Supplied External Reference**
- **Three Selectable Power-Down Impedance**
  - **1kΩ, 100kΩ, or High Impedance**
- **Power-Up Reset to Midscale or Zero**
- **Supports Entire Family of Octal SPI/I²C DACs**
- **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**
- **USB-Powered (Cable Included)**
- **Demonstrates Configurable Interface Watchdog Timer**
- **Fully Assembled and Tested with Proven PCB Layout**

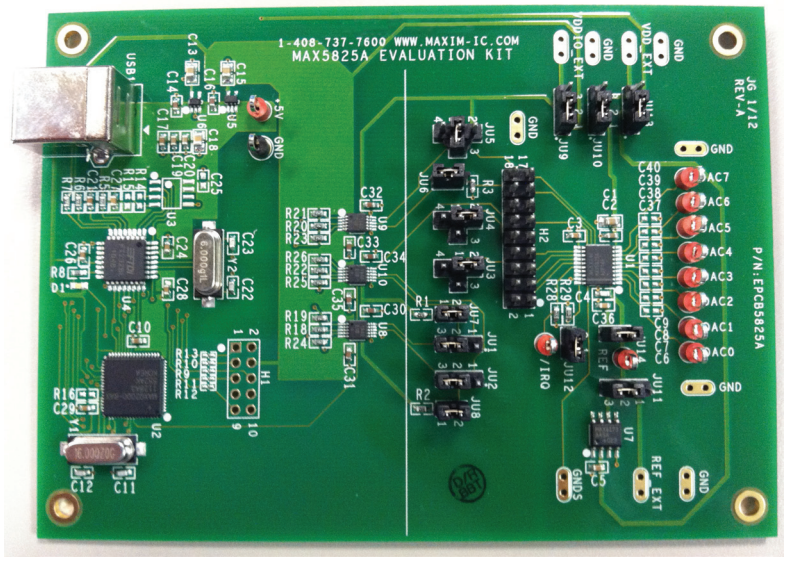

Figure 1. MAX5825A EV Kit

Windows, Windows XP, and Windows Vista are registered trademarks of Microsoft Corp.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C13, C15	3	10µF ±10%, 10V X7R ceramic capacitors (0805) Murata GRM21BR71A106K
C2, C3, C5, C10, C17, C19, C20, C24, C26–C29, C36	13	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C4	1	100pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H101J
C6–C9, C25, C37–C40	0	Not installed, ceramic capacitors (0603)
C11, C12	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J
C14, C16, C30–C35	8	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K
C18	1	4.7µF ±10%, 10V X5R ceramic capacitor (0805) Murata GRM219R61A475K
C21	1	0.033µF ±10%, 25V X7R ceramic capacitor (0603) Murata GRM188R71E333K
C22, C23	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
D1	1	Green LED (0603)
DAC0–DAC7, $\overline{IRQ}$, REF, +5V	11	Red multipurpose test points
GND	1	Black multipurpose test point
H1	0	Not installed, 10-pin (2 x 5) header
H2	1	18-pin (2 x 9) header
JU1, JU2, JU9, JU10, JU11, JU13	6	3-pin headers
JU3, JU4, JU5	3	4-pin headers
JU6, JU7, JU8, JU12, JU14	5	2-pin headers

DESIGNATION	QTY	DESCRIPTION
R1, R2, R28	3	4.7kΩ ±5% resistors (0603)
R3	1	1MΩ ±5% resistor (0603)
R5, R18–R26	10	1.5kΩ ±5% resistors (0603)
R6, R7	2	27Ω ±5% resistors (0603)
R8	1	220Ω ±5% resistor (0603)
R9–R13, R16	0	Not installed, resistors (0402) R9–R13 are short (PC trace); R16 is open
R14, R15	0	Not installed, resistors (0603)
R29	1	100kΩ ±5% resistor (0603)
U1	1	12-bit, 8-channel DAC (20 TSSOP) Maxim MAX5825AAUP+
U2	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U3	0	Not installed, EEPROM (8 SO)
U4	1	UART-to-USB converter (32 LQFP)
U5	1	3.3V LDO regulator (5 SC70) Maxim MAX8511EXK33+
U6	1	2.5V LDO regulator (5 SC70) Maxim MAX8511EXK25+
U7	1	2.5V voltage reference (8 SO) Maxim MAX6173AASA+
U8, U9, U10	3	Level translator (10 µMAX®) Maxim MAX1840EUB+
USB1	1	USB type-B, right-angle PC-mount receptacle
Y1	1	16MHz crystal (HCM49) Hong Kong X'tals SSM16000N1HK188F0-0
Y2	1	6MHz crystal (HCM49) Hong Kong X'tals SSL60000N1HK188F0-0
—	1	USB high-speed A-to-B cable (6 ft)
—	14	Shunts
—	1	PCB: MAX5825A EVALUATION KIT

**EP = Exposed pad.*

µMAX is a registered trademark of Maxim Integrated Products, Inc.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

Note: *Indicate that you are using the MAX5825A when contacting these component suppliers.*

MAX5825A EV Kit Files

FILES	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX5825A.EXE	Application program
CDM20600.EXE	Installs the USB device driver
UNINSTALL.EXE	Uninstalls the EV kit software
USB_Driver_Help_200.PDF	USB driver installation help file

Quick Start

Required Equipment

- MAX5825A EV kit (USB cable included)
- Windows XP, Windows Vista, or Windows 7 PC with a spare USB port
- Digital voltmeter (DVM)

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Verify that jumpers JU1–JU14 are in their default position, as shown in Table 1.
2) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 5825ARxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
3) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
4) Connect the USB cable from the PC to the EV kit board. A Windows message appears when connecting the EV kit board to the PC for the first time. Each version of Windows has a slightly different message. If you see a Windows message stating **ready to use**, then proceed to the next step. Otherwise, open the USB_Driver_Help_200.PDF document in the Windows **Start | Programs** menu to verify that the USB driver was installed successfully.
5) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 2.
6) Within the **DACs** tab sheet, press the **EXECUTE** button in the **Quick DAC Output Voltage** group box.
7) Use the GNDS PCB pad for the negative terminal of the DVM and use the positive terminal to measure the voltage at the DAC_ test points. Verify that the voltages measured are 1.25V.

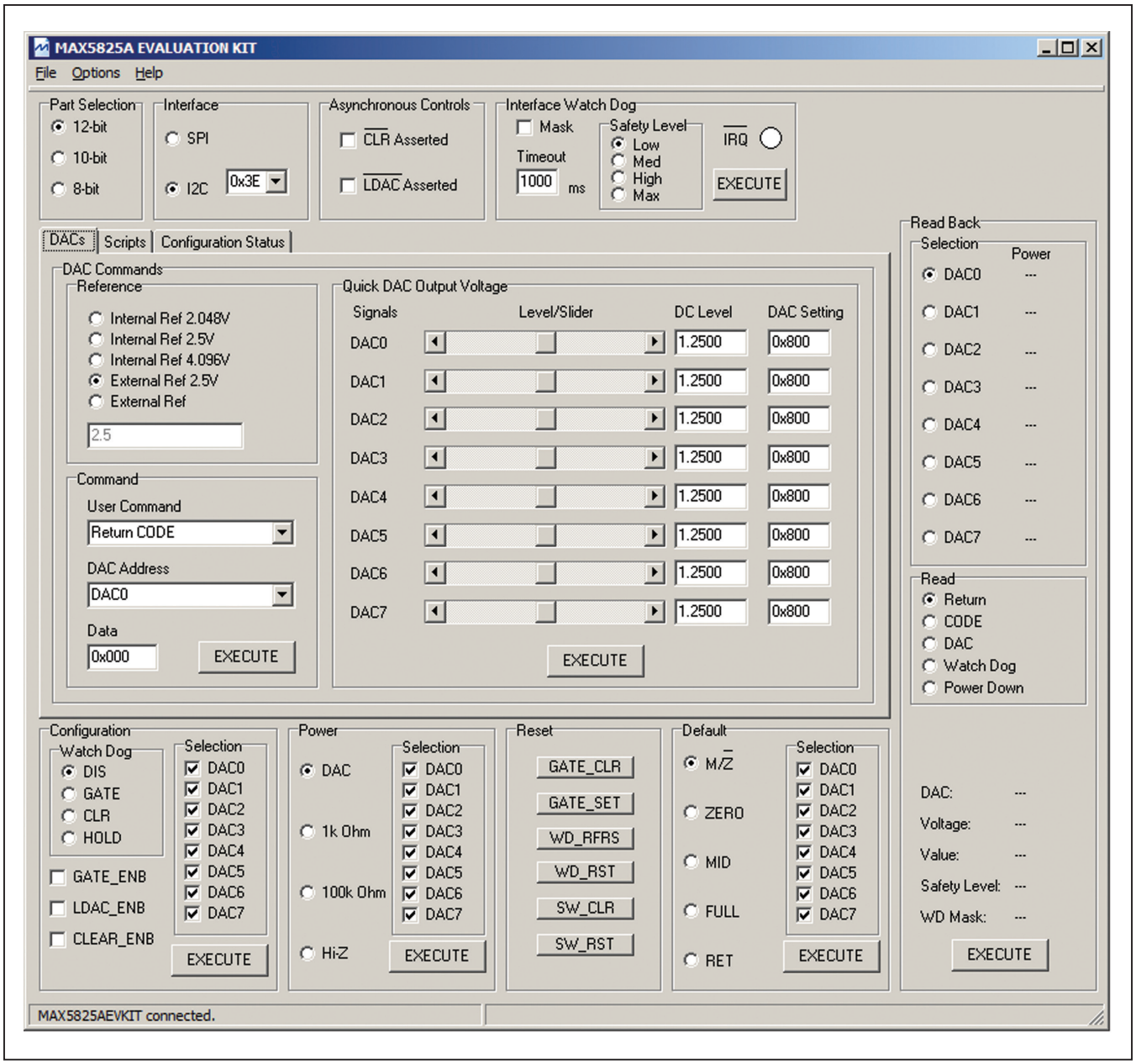

Figure 2. MAX5825A EV Kit Software Main Window (DACs Tab)

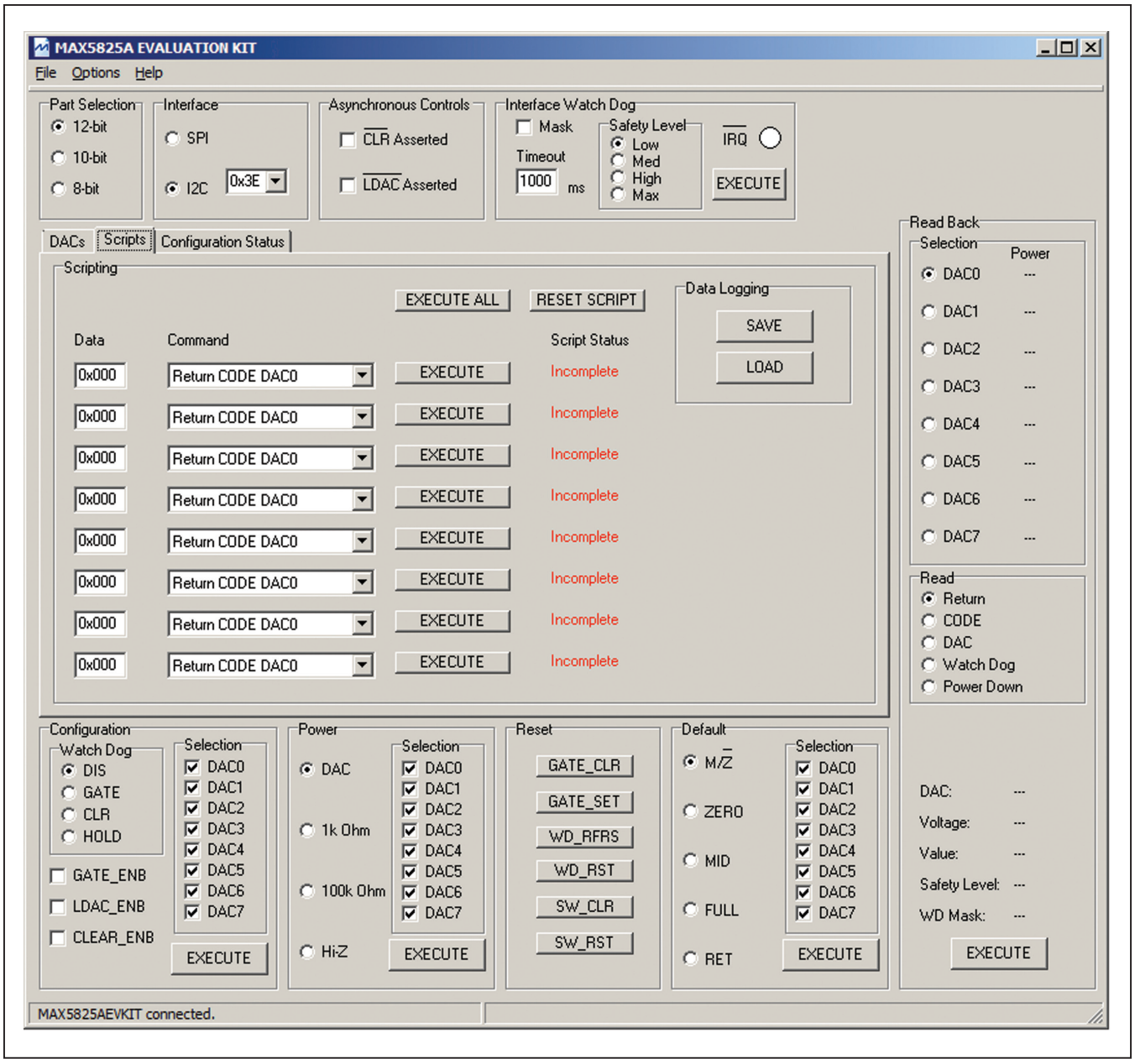

Figure 3. MAX5825A EV Kit Software Main Window (Scripts Tab)

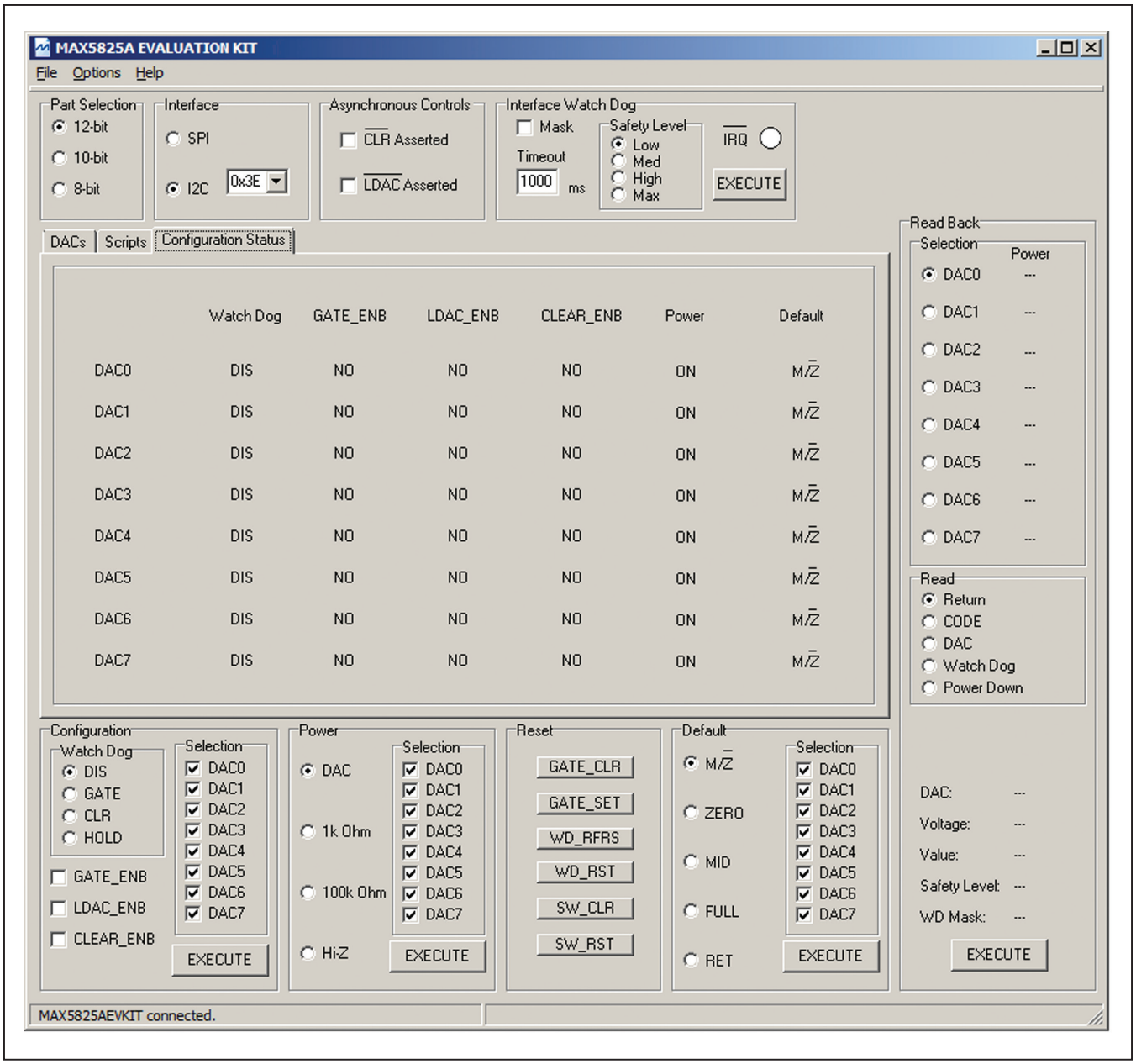

Figure 4. MAX5825A EV Kit Software Main Window (Configuration Status Tab)

Detailed Description of Software

The MAX5825A EV kit software evaluates the MAX5825A I²C interface family of 12-/10-/8-bit DACs. The main software window has three tabs: **DACs**, **Scripts**, and **Configuration Status**. Within the **DACs** tab sheet (Figure 2), the user can set the reference and the DAC outputs. The **Scripts** tab sheet (Figure 3) allows the user to send a sequence of write commands to the eight DACs and load and save the write sequence. The **Configuration Status** tab sheet (Figure 4) displays the configuration settings for each DAC. In addition, the software also allows the user to adjust the configuration, power, reset, and default settings.

Demo Mode

The EV kit software enters the demo mode when the USB connection is not detected. When in demo mode, all communication to the EV kit is disabled; however, most of the software is functional. Demo mode allows the user to evaluate the software without hardware connectivity.

Part Selection

The user must select the appropriate radio button in the **Part Selection** group box that corresponds to the installed Maxim IC DAC bits.

I²C Address

When the software first starts up, the **I2C** radio button is selected automatically if a valid I²C address is on the bus. The **Interface** group box displays the I²C address. If the address is not found, the software prompts the user to search for the I²C address or place the software into demo mode. The software automatically detects the correct address from the drop-down list. See Table 2 for a list of the I²C addresses.

Reference

The reference default configuration is set to 2.5V using the external voltage reference IC (U7). The external 2.5V reference can be connected between the EXT_REF pin and its corresponding ground. Select the **External Ref** radio button and type the reference voltage into the edit box. Removing the shunt from jumper JU11 allows internal reference options, which include 2.048V, 2.5V, and 4.096V selection, by using the corresponding radio button. Make sure the VDD supply is greater or equal to the voltage reference selected for proper operation. When the EV kit uses the on-board +3.3V supply to power the IC, the **4.096V** radio button selection will not provide the 4.096V. See the *User-Supplied Reference* section for further information.

DAC Commands

Within the **DACs** tab sheet shown Figure 2, the user can set the output of the DACs with two options. The first option is the **Quick DAC Output Voltage** group box that allows the user to write and load the CODE to all DACs. Set the desired output for each DAC using the corresponding slider and press the **EXECUTE** button. The second option is to write the return CODE, write the CODE, load the CODE, or write and load the CODE to the desired DAC using the drop-down lists and edit box within the **Command** group box. Press the **EXECUTE** button once all the settings are appropriately configured.

DAC Commands (Script)

Within the **Scripts** tab sheet shown in Figure 3, enter the desired **Data** on the left and choose the appropriate **Command** from the drop-down list in the **Scripting** group box. Pressing the **EXECUTE** button writes to the CODE and/or DAC registers and the **Script Status** changes from **Incomplete** to **Complete**. Refer to the MAX5825A IC data sheet for a list of possible commands. If a sequence of commands needs to be performed, adjust all **Data** edit boxes and **Commands** drop-down list accordingly, and press the **EXECUTE ALL** button. To reset the **Script Status** to **Incomplete**, press the **RESET SCRIPT** button.

Data Logging

By pressing the **SAVE** button, the sequence of commands is saved into a text file. To recall the sequence, press the **LOAD** button and select the appropriate text file.

Configuration Status

The **Configuration Status** tab sheet shown in Figure 4 displays the current status of the configuration, power, and default settings for each DAC.

Read Back

The EV kit reads back the return values, CODE values, DAC values, watchdog safety status, or power status. Select the appropriate **Read** radio button and press the **EXECUTE** button within the **Read Back** group box.

Asynchronous $\overline{CLR}$

Checking the **$\overline{CLR}$ Asserted** checkbox in the **Asynchronous Controls** group box drives the $\overline{CLR}$ pin of the device low, which clears the content of both CODE and DAC registers. Unchecking the **$\overline{CLR}$ Asserted** checkbox drives the $\overline{CLR}$ pin high and writing new commands is allowed again.

Asynchronous LDAC

Checking the **LDAC Asserted** checkbox drives the LDAC pin of the device low, which allows writing to the CODE register and then automatically transfers to the DAC register to change the DAC's output. Unchecking the **LDAC Asserted** checkbox drives the LDAC pin high. To change the DAC outputs, the user must write to the CODE registers and then write to the DAC registers.

Interface Watch Dog

Use the **Mask** checkbox, **Timeout** edit box, and S**afety Level** radio buttons in the **Interface Watch Dog** group box to set the watchdog. The timeout time range that can be entered into the edit box is **1**ms to **4095**ms. The user must allow enough timeout time to send data to the DAC(s). It is recommended that the user set the timeout time to the maximum time of 4095ms since the time that Windows takes to communicate with the part can vary. In addition, configure the DAC output settings before pressing the **EXECUTE** button. The **IRQ** circle changes from white to red when the IRQ signal goes low.

Refer to the MAX5823/MAX5824/MAX5825 IC data sheet for a detailed description.

Configuration

The configuration command includes the **Watch Dog** radio buttons and the **GATE_ENB**, **LDAC_ENB**, and **CLEAR_ENB** checkboxes for selected DAC(s). See the **Configuration Status** tab sheet to monitor the settings on each DAC. Refer to MAX5823/MAX5824/MAX5825 IC data sheet for a detailed description.

Power

The power command is selectable for individual DACs. When a DAC is selected, the channel is active. Other options include powering down with 1kΩ termination to GND, 100kΩ termination to GND, and high impedance. Once the appropriate selection is made, press the **EXECUTE** button.

Reset

The reset command allows the user to set or clear the gate, refresh or reset the watchdog timer, or issue a software reset or clear. Refer to the MAX5823/MAX5824/MAX5825 IC data sheet for a detailed description.

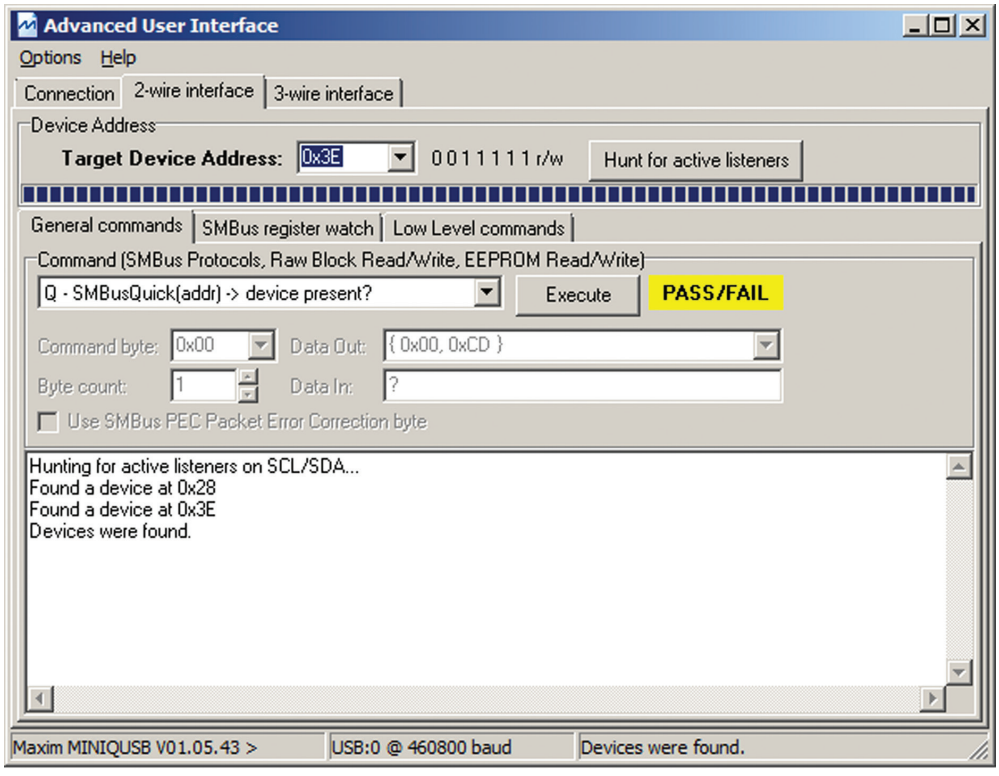

Figure 5. Advanced User Interface Window (2-Wire Interface Tab)

Default

The default command allows the user to set the default settings for individual DACs. Refer to MAX5823/MAX5824/ MAX5825IC data sheet for a detailed description.

Advanced User Interface

There are two methods for communicating with the IC. The first is through the windows shown in Figure 1. The second is through the **Advanced User Interface** window shown in Figure 5. The **Advanced User Interface** window becomes available by selecting the **Options I Interface (Advanced User)** menu item and allows execution of serial commands manually.

This interface is not recommended unless the user has to change individual bits in the interface.

Detailed Description of Hardware

The MAX5825A EV kit provides a proven layout for the MAX5825A IC. An on-board reference (MAX6173), USB interface circuitry, and jumpers to disconnect the on-board microcontroller are included on the EV kit.

I²C Address

The I²C address of the IC is determined by the shunt settings of jumpers JU3 and JU4. See Table 2 for all possible hexadecimal addresses.

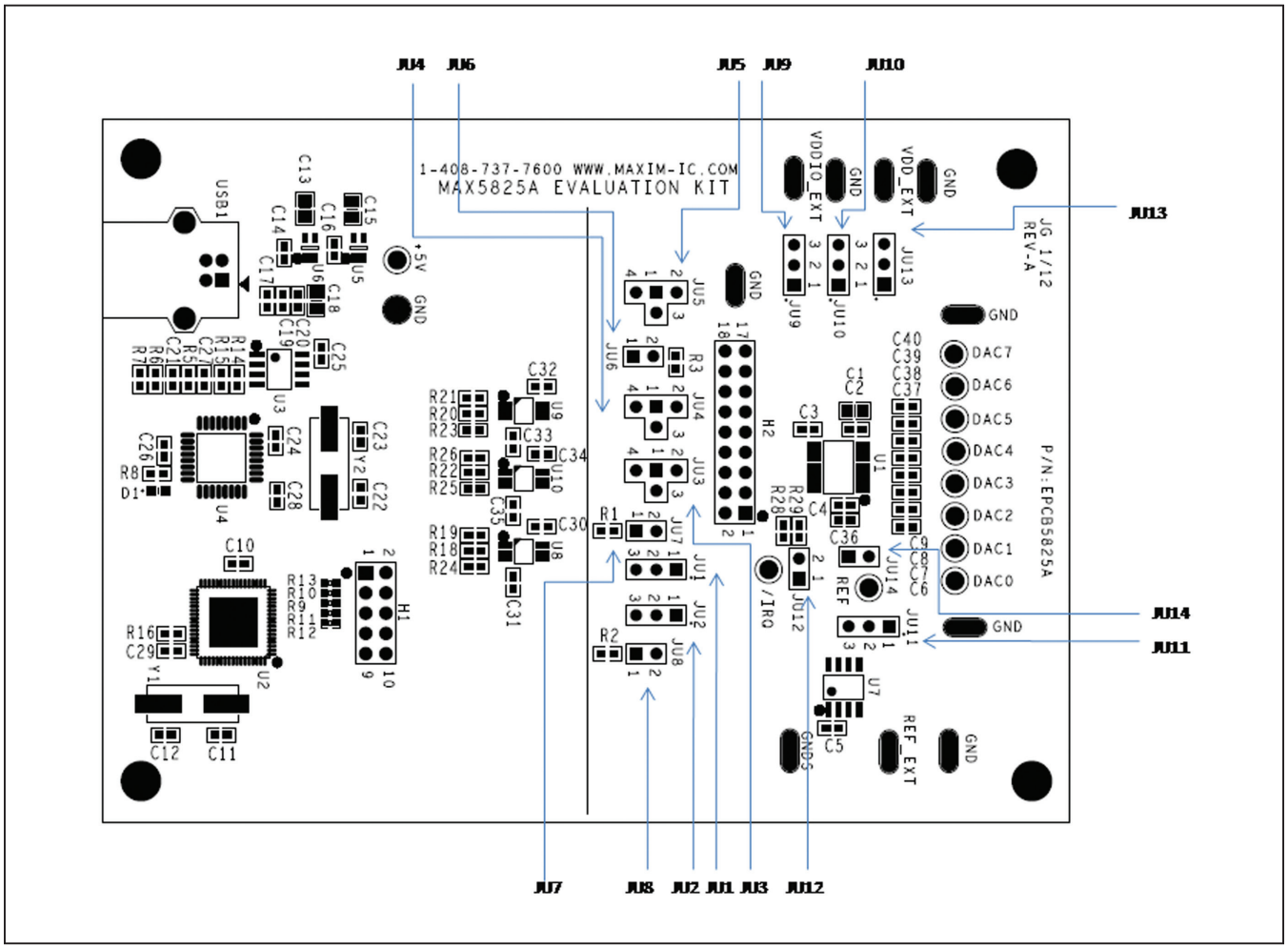

Figure 6. Jumper Callouts

Table 1. Jumper Settings (JU1–JU14)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2	Do not install.
	2-3*	Connects the SDA signal of the on-board microcontroller to the SDA pin of IC U1.
	Not installed	User-supplied SDA. Apply appropriate signal at header pin H1-1.
JU2	1-2	Do not install.
	2-3*	Connects the SCL signal of the on-board microcontroller to the SCL pin of IC U1.
	Not installed	User-supplied SCL. Apply appropriate signal at header pin H1-3.
JU3	1-2*	Connects the ADDR0 pin of IC U1 to VDDIO to determine the I²C address. See Table 2.
	1-3	Do not install.
	1-4	Connects the ADDR0 pin of IC U1 to DGND to determine the I²C address. See Table 2.
JU4	1-2*	Connects the ADDR1 pin of IC U1 to VDDIO to determine the I²C address. See Table 2.
	1-3	Do not install.
	1-4	Connects the ADDR1 pin of IC U1 to DGND to determine the I²C address. See Table 2.
JU5	1-2	Connects the $\overline{LDAC}$ pin of IC U1 to VDDIO.
	1-3*	Connects the $\overline{LDAC}$ signal of the on-board microcontroller to the $\overline{LDAC}$ pin of IC U1.
	1-4	Connects the $\overline{LDAC}$ pin of IC U1 to GND.
JU6	Installed*	Connects the $\overline{CLR}$ signal of the on-board microcontroller to the $\overline{CLR}$ pin of IC U1.
	Not installed	User-supplied $\overline{CLR}$. Apply the appropriate signal at header pin H1-15.
JU7	Installed*	Connects pullup resistor R1 to the I²C SDA signal.
	Not installed	Disconnects pullup resistor R1 from the SDA pin of IC U1.
JU8	Installed*	Connects pullup resistor R2 to the I²C SCL signal.
	Not installed	Disconnects pullup resistor R2 from the SCL pin of IC U1.
JU9	1-2*	Connects the VDDIO pin of IC U1 to the on-board +3.3V supply.
	2-3	Connects the VDDIO pin of the IC U1 to a user-supplied power supply between +1.7V and +5.5V (VDDIO_EXT).
JU10	1-2*	Connects the VDD pin of IC U1 to the on-board +3.3V supply
	2-3	Connects the VDD pin of IC U1 to a user-supplied power supply between +2.7V and +5.5V (VDD_EXT).
JU11	1-2	User-supplied REF. The user must apply a voltage reference at the REF_EXT PCB pad.
	2-3*	Connects the on-board voltage reference IC (U7) to the REF pin of IC U1.
JU12	Installed*	Connects the M/$\overline{Z}$ pin of IC U1 to VDD.
	Not installed	Connects the M/$\overline{Z}$ pin of IC U1 to the 100kΩ pulldown resistor.
JU13	1-2*	Powers IC U7 using the USB supply.
	2-3	Powers IC U7 using the user-supplied power supply.
JU14	Installed*	Connects the additional bypass capacitor C36 on the REF pin of IC U1.
	Not installed	Disconnect the additional bypass capacitor C36 on the REF pin of IC U1.

**Default position.*

Table 2. I²C Address Settings

SHUNT POSITION		MAX5825A ADDRESS (hex)	
JU3 (ADDR0)	JU4 (ADDR1)	WRITE	READ
1-4	1-4	0x20	0x21
Not installed	1-4	0x24	0x25
1-2*	1-4	0x26	0x27
1-4	Not installed	0x30	0x31
Not installed	Not installed	0x34	0x35
1-2*	Not installed	0x36	0x37
1-4	1-2*	0x38	0x39
Not installed	1-2*	0x3C	0x3D
1-2*	1-2*	0x3E	0x3F

**Default position.*

User-Supplied Power Supply

The EV kit is powered completely from the USB port by default. To power the IC with a user-supplied power supply, move the shunt on jumper JU10 to the 2-3 position and apply a 2.7V to 5.5V power supply at the VDD_EXT and the nearest GND PCB pads on the EV kit.

The on-board voltage reference (U7) is powered from the USB interface circuit when the shunt is installed in the 1-2 position on jumper JU13. To use the same external supply applied at the VDD_EXT PCB pad, move the shunt to the 2-3 position on JU13.

User-Supplied Reference

The on-board voltage reference (U7) generates a voltage reference of 2.5V. The user can apply an external voltage reference by moving the shunt on jumper JU11 to the 2-3 position and applying between 2V and VDD at the REF_EXT PCB pad on the EV kit. If the internal reference is selected, the REF pin becomes an output. In this case, JU11 should be removed.

User-Supplied I²C

To evaluate the EV kit with a user-supplied I²C bus, remove shunts from jumpers JU1 and JU2. Apply the user-supplied SDA signal to header pin H1-1 and the user-supplied SCL signal to header pin H1-3. If pullup resistors are on the user-supplied interface, shunts must not be installed on jumpers JU7 and JU8. Connect the user-supplied I²C ground to header pins H1-2 or H1-4.

User-Supplied $\overline{IRQ}$, $\overline{CLR}$, and $\overline{LDAC}$

Remove shunts from jumpers JU5 and JU6. Apply the user-supplied $\overline{IRQ}$, $\overline{CLR}$, and $\overline{LDAC}$ to header pins H1-11, H1-15, and H1-17, respectively. Connect the user-supplied signal ground to header pins H1-12, H1-16, and H1-18.

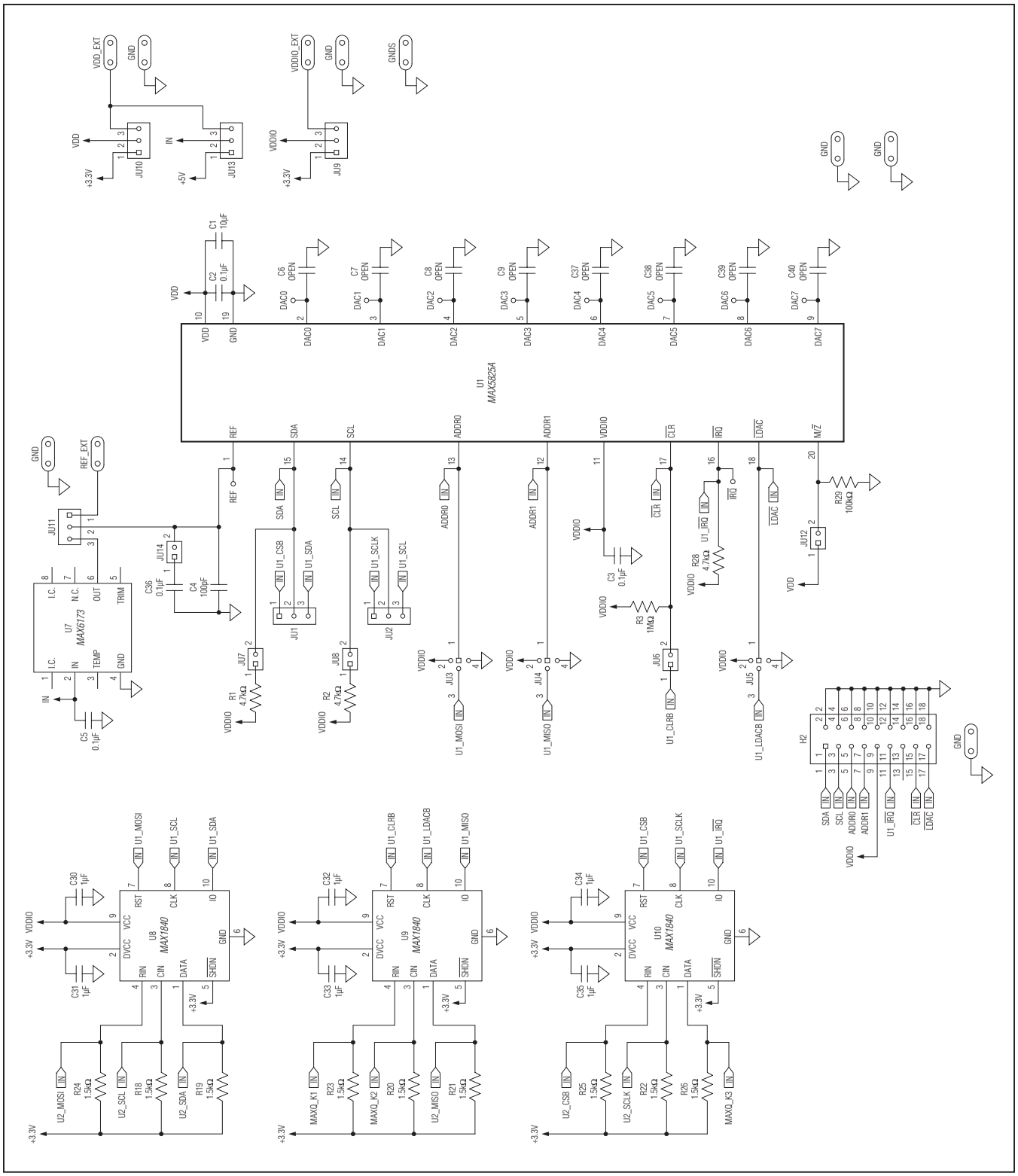

Figure 7a. MAX5825A EV Kit Schematic (Sheet 1 of 2)

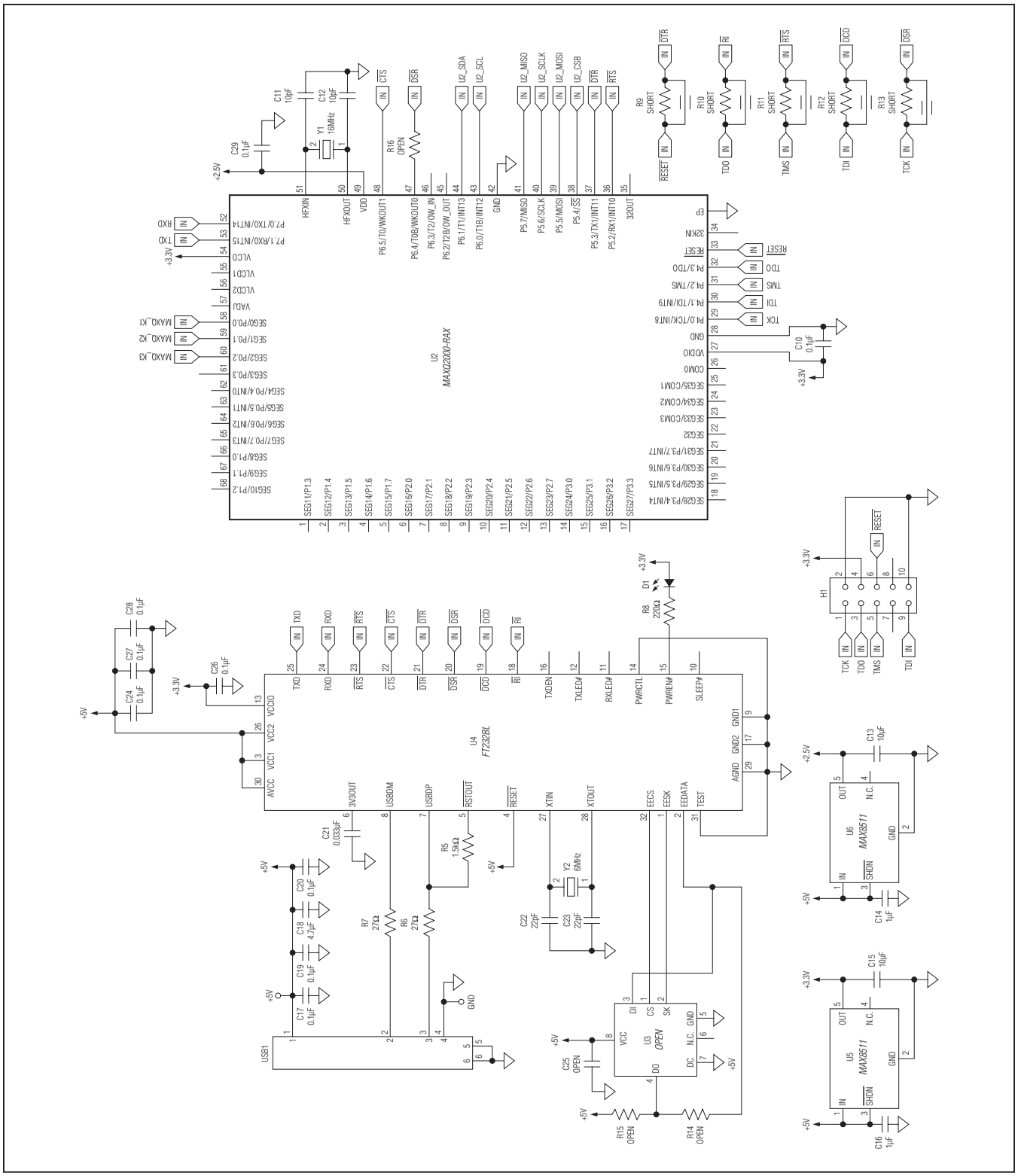

Figure 7b. MAX5825A EV Kit Schematic (Sheet 2 of 2)

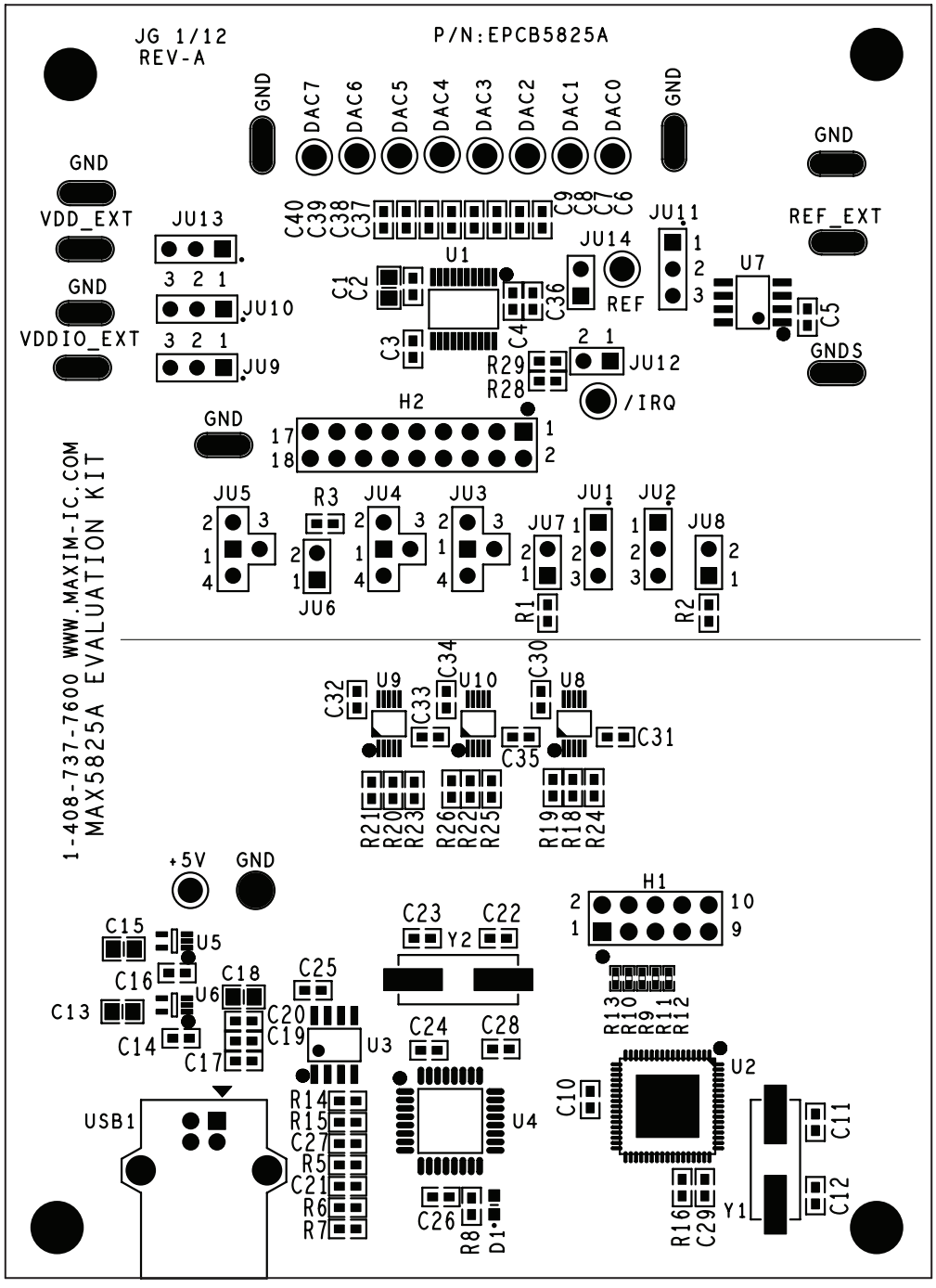

Figure 8. MAX5825A EV Kit Component Placement Guide—Component Side

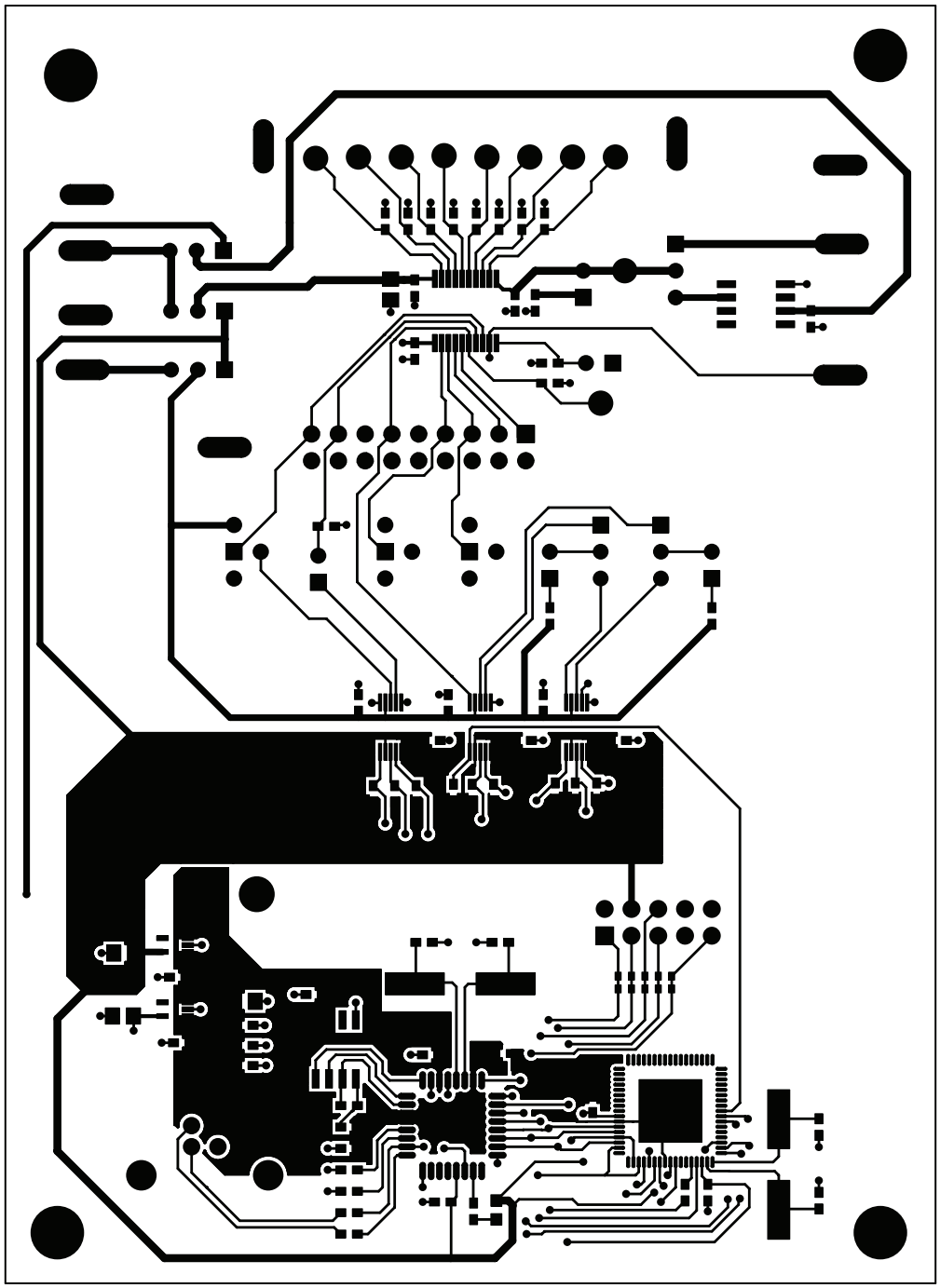

Figure 9. MAX5825A EV Kit PCB Layout—Component Side

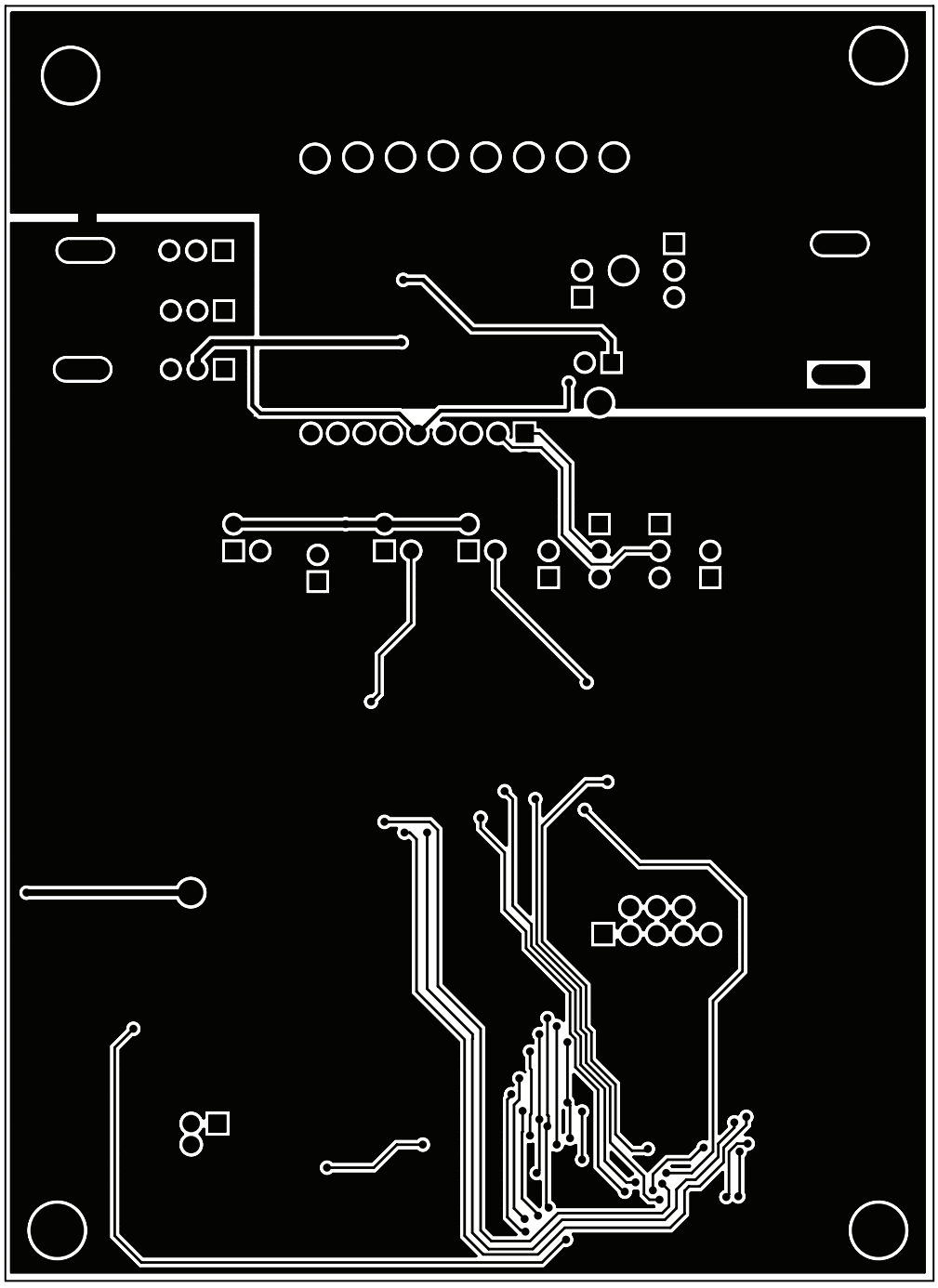

Figure 10. MAX5825A EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX5825AEVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/12	Initial release	—