19-3723; Rev 0; 6/05

MAXIM

MAX6884 Evaluation System/Evaluation Kit

Evaluate: MAX6884/MAX6885

General Description

The MAX6884 evaluation system (EV system) consists of a MAX6884 evaluation kit (EV kit) and a Maxim CMOD232 command module. The MAX6884 EEPROM-configurable, multivoltage supply supervisor monitors six voltage-detector inputs and an auxiliary input. The MAX6884 also features programmable outputs for highly configurable power-supply supervisory applications. The evaluation software runs under Windows®98/2000/XP, providing a handy user interface to exercise the features of the MAX6884.

Order the complete EV system (MAX6884EVCMOD2) for comprehensive evaluation of the MAX6884 using a personal computer. Order the EV kit (MAX6884EVKIT) if the command module has already been purchased with a previous Maxim EV system, or for custom use in other µC-based systems.

MAX6884 Stand-Alone EV Kit

The MAX6884 EV kit provides a proven PC board layout to facilitate evaluation of the MAX6884. It must be interfaced to appropriate timing signals for proper operation. Connect 3.3V power, ground-return, and SCL/SDA interface signals to the breakout header pins (see Figure 8). The LEDs are optional circuits, which can be powered separately or disabled altogether. Refer to the MAX6884 data sheet for timing requirements.

MAX6884 EV System

The evaluation software runs under Windows 98/2000/XP on an IBM PC, interfacing to the EV system board through the computer's serial communications port. See the *Quick Start* section for setup and operating instructions.

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SMBus is a trademark of Intel Corp.

**Purchase of I²C components of Maxim Integrated Products, Inc., or one of its sublicensed Associated Companies, conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.*

Features

- **Proven PC Board Layout**
- **I²C*-Compatible 2-Wire Serial Interface**
- **Easy-to-Use Menu-Driven Software**
- **Assembled and Tested**
- **Includes Windows 98/2000/XP-Compatible Software and Demo PC Board**
- **Also Evaluate MAX6885**

Ordering Information

PART	TEMP RANGE	IC-PACKAGE	I²C INTERFACE TYPE
MAX6884EVKIT	0°C to +70°C	20 TQFN	User Supplied
MAX6884EVCMOD2	0°C to +70°C	20 TQFN	CMOD232

Note: *To evaluate the MAX6885, request a MAX6885ETP free sample with the MAX6884EVKIT.*
The MAX6884 EV kit software is provided with the MAX6884 EV kit; however, the CMOD232 board is required to interface the EV kit to the computer when using the included software.

Component List

DESIGNATION	QTY	DESCRIPTION
C1–C6	6	0.1µF ±20%, 10V X5R ceramic capacitors (0402) TDK C1005X5R1A104M
C8, C9	2	1.0µF ±20%, 6.3V X5R ceramic capacitors (0402) TDK C1005X5R0J105M
D1, D2, D3	3	Green surface-mount LEDs (SS)
J1–J4	4	5-pin headers (cut to fit)
J5	1	2 x 10 right-angle female receptacle
JU1–JU4	4	Jumper, 3-pin headers
JU5	1	Jumper, 2-pin header
R1, R2, R3	3	620Ω ±5% resistors (1206)
R4, R5, R6	3	10kΩ ±5% resistors (0603)
R7, R8	0	Not installed, resistors (0603)
SW1	1	Momentary pushbutton switch (NO)
U1	1	Maxim MAX6884ETP (20-pin TQFN 5mm x 5mm)
None	5	Shunts
None	1	MAX6884 PC board
None	1	Software disk (CD-ROM), MAX6884 evaluation kit

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
TDK	847-803-6100	847-390-4405	www.component.tdk.com

Note: *Indicate that you are using the MAX6884/MAX6885 when contacting this component supplier.*

Quick Start

Recommended Equipment

- Maxim MAX6884EVCMOD2 (contains MAX6884 EV kit board and CMOD232 module)
- DC power supply, 9VDC at 200mA (included with CMOD232 module)
- Computer running Windows 98, 2000, or XP with a spare serial (COM) port
- Standard 9-pin, **straight-through**, male-to-female cable (serial extension cable) to connect the computer's serial port to the Maxim command module interface board
- DC power supply, 3.3V at 100mA

Procedure

The MAX6884 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Do not turn on the power supply until all connections are completed:**

Command Module Setup

1) Enable the SDA/SCL pullup resistors on the command module by setting both switches (SW1) to the on position.
2) Set the command module working voltage to 3.3V by placing a shunt across pins 1-2 of the VDD select jumper (J1).
3) Connect a cable from the computer's serial port to the command module (CMOD232) interface board. Use a **straight-through** 9-pin male-to-female cable. To avoid damaging the EV kit or your computer, do not use a 9-pin null-modem cable or any other proprietary interface cable that is physically similar to the straight-through cable.
4) Connect the provided wall cube power supply to the CMOD232 board.

EV Kit Setup

5) Ensure that the I^2C address of the MAX6884 is set to 0xA0h by verifying that a shunt is placed across pins 2-3 of jumper JU4.
6) Ensure that shunts are installed across pins 2 and 3 of jumpers JU1, JU2, and JU3.
7) Ensure that a shunt is NOT installed on jumper JU5.
8) Connect the 3.3V DC power supply to the VLED and GND pads.
9) Connect the 3.3V DC power supply to the VCC and GND pads.
10) Carefully align the 20-pin connector of the MAX6884 EV kit with the 20-pin header of the CMOD232 interface board. Gently press them together.
11) The MAX6884.EXE software program can be run from the CD-ROM or hard drive. Use the INSTALL.EXE program to copy the files and create icons in the Windows 98/2000/XP **Start** menu.
12) Plug the CMOD232 wall cube into an electrical outlet.
13) Turn on the 3.3V power supply.
14) Start the MAX6884 program by opening its icon in the **Start** menu.
15) Normal device operation can be verified by the "Status: MAX6884 Operational" text in the interface box.

Detailed Description of Software

Main Window

The evaluation software's main window (Figure 1) consists of an **Interface** diagnostic box, an **ADC Conversion Results** box, the MAX6884 Control Tabs (see below) and some system-level controls.

The **Interface** box indicates the current **Device** information, the **Register** address, **I^2C SCL Speed**, and the **Data** sent or received for the last read/write operation. Select the installed device **Part #** and **Address** using the appropriate controls. The double arrows (>> or <<) indicate the direction of the data flow; where >> indicates that the master (CMOD232 board) device is transmitting data to the slave (MAX6884) and << indicates that the master device is receiving data from the slave.

The software polls the checked ADC conversion registers of the MAX6884 every 500ms. To stop reading these registers, uncheck the appropriate checkbox in the **ADC Conversion Results** section of the MAX6884 software. Select the desired reference type (**Internal** or **External**) from the **Reference** drop-down box. Enter

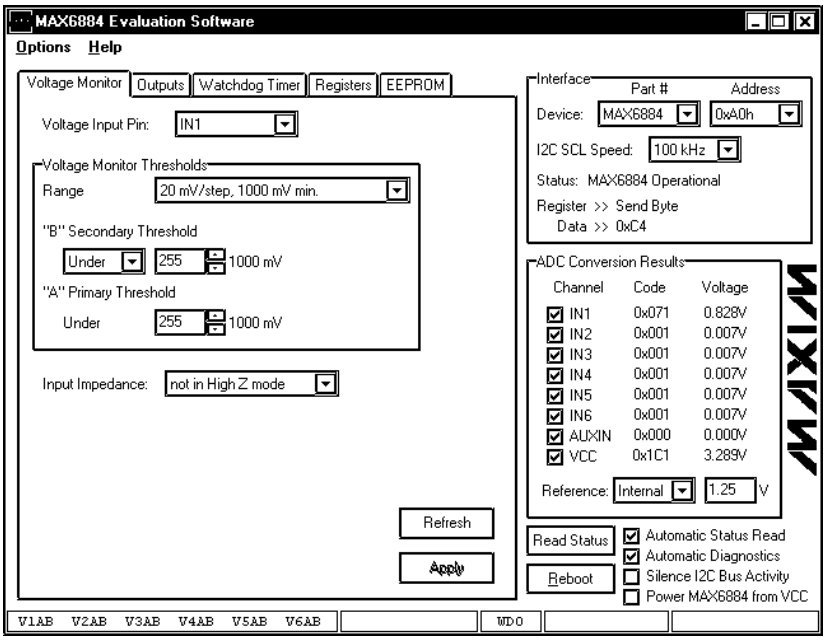

Figure 1. MAX6884 EV Kit Software Main Window

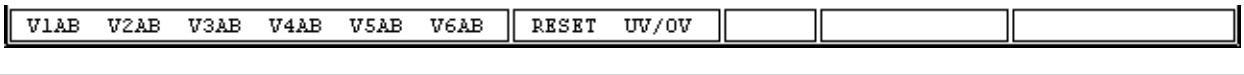

Figure 2. MAX6884 EV Kit Software Status Bar

the reference voltage in the adjacent box when using the **External** reference feature.

The MAX6884 EV kit software continuously polls the MAX6884 to make sure the two boards have not become inadvertently disconnected. An undesired result of this polling is constant activity on the I²C-compatible bus. This feature may make it difficult to monitor the I²C-compatible bus for desired bit patterns. Disable this feature by checking the **Silence I²C Bus Activity** checkbox.

Automatic Diagnostics are required to ensure that the CMOD232 board does not become disconnected from the PC. Disable this function by resetting the **Automatic Diagnostics** checkbox.

Click the **Reboot** button to initiate a software reboot. Force the MAX6884 to draw power from the VCC pin (instead of an IN_ pin) by checking the **Power MAX6884 from VCC** checkbox.

WARNING: Improper use of the **Power MAX6884 from VCC** checkbox may cause damage to the device and EV kit. Refer to the *Powering the MAX6884/MAX6885* section in the MAX6884/MAX6885 data sheet for details on how to correctly apply power to the MAX6884.

Status Bar

The status bar (Figure 2) displays the MAX6884 status information and is updated every 500ms. Disable status reads by unchecking the **Automatic Status Read** checkbox. Force a manual status read by clicking the **Read Status** button.

When a voltage monitor detects that the (A) or (B) threshold is crossed, a fault condition is asserted. This fault register status is displayed in the status bar. V2A_ indicates that IN2 is under its A threshold, V3_B indicates that IN3 has crossed its B threshold, and V6AB indicates that IN6 has crossed both its A and B thresholds.

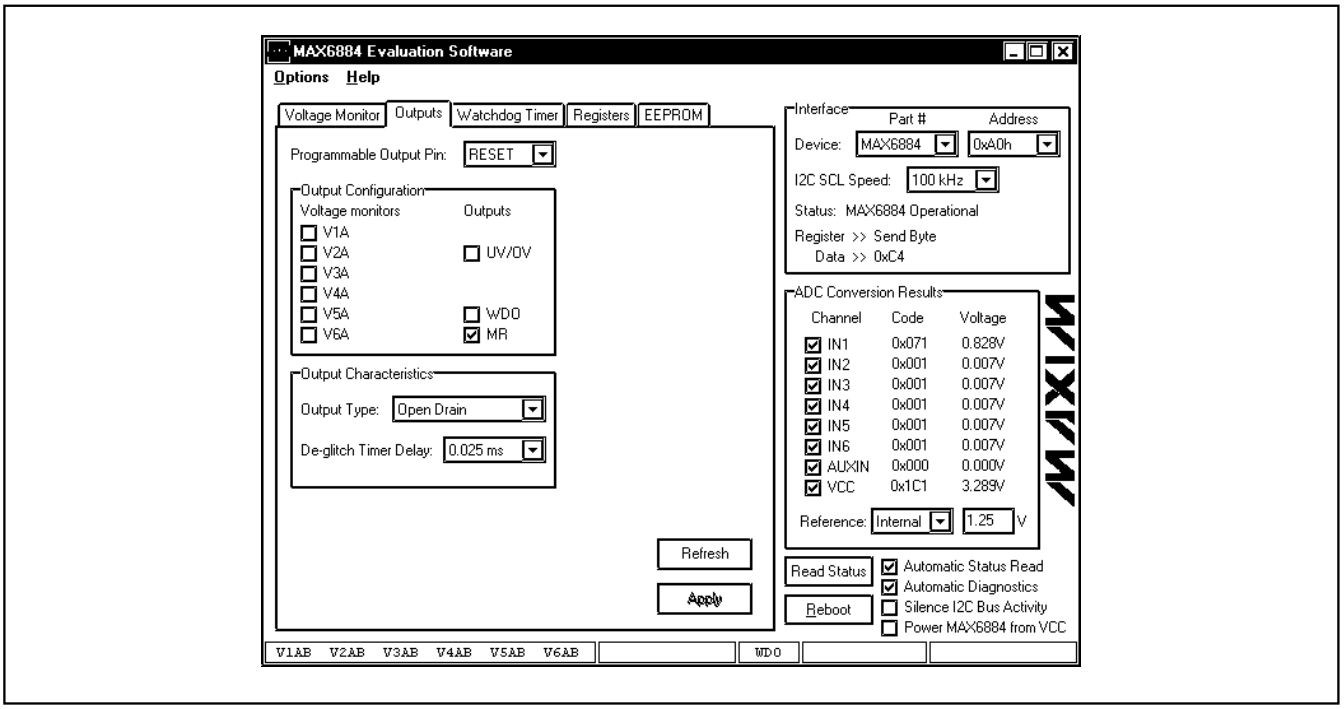

Figure 3. MAX6884 EV Kit Software Outputs Tab

If an output is asserted, that output is also displayed in the status bar. **RESET** indicates that the $\overline{\text{RESET}}$ output has been asserted. **UV/OV** indicates that the $\overline{\text{UV/OV}}$ output has been asserted. **WDO** indicates that the watchdog timer output has been asserted.

Voltage Monitor Tab

The **Voltage Monitor** tab (Figure 1) configures voltage monitor thresholds and input impedance for the MAX6884 IN1–IN6 inputs. Adjust the **Range** drop-down, **"A" Primary Threshold**, and **"B" Secondary Threshold** controls until the desired thresholds are set.

Press the **Refresh** button to read the current values from the MAX6884. Press the **Apply** button to send the software value to the MAX6884.

Outputs Tab

The outputs of the MAX6884 are triggered by the logical AND of the selected control inputs. Select the control inputs from the **Output Configuration** box (Figure 3). Choose the output pin to modify from the **Programmable Output Pin** drop-down on the **Outputs** tab. Choose the **Output Type** and **De-glitch Timer Delay** from the Output Characteristics box.

Press the **Refresh** button to read the current values from the MAX6884. Press the **Apply** button to send the software values to the MAX6884.

Watchdog Timer Tab

A watchdog timer asserts a fault condition after a period of time, unless the timer is periodically reset by the WDI input pin being toggled. This fault register status is displayed in the status bar as **WDO**. Configure the watchdog timer settings from the **Watchdog Timer** tab (Figure 4).

During normal operation, an enabled watchdog timer must be serviced by toggling the WDI pin periodically (**"A" timeout duration**). Typically an external piece of firmware services the watchdog timer by toggling the WDI pin inside a loop, and watchdog timer assertion is configured to drive an output pin. Any software defect that halts the firmware then causes the watchdog timer to assert.

The initial timeout period (**"B" timeout duration**) can be set to a longer value to allow time for software initialization. Enable the watchdog timer by checking the **Enable Watchdog Timer** checkbox. The desired **Output Type** can also be programmed.

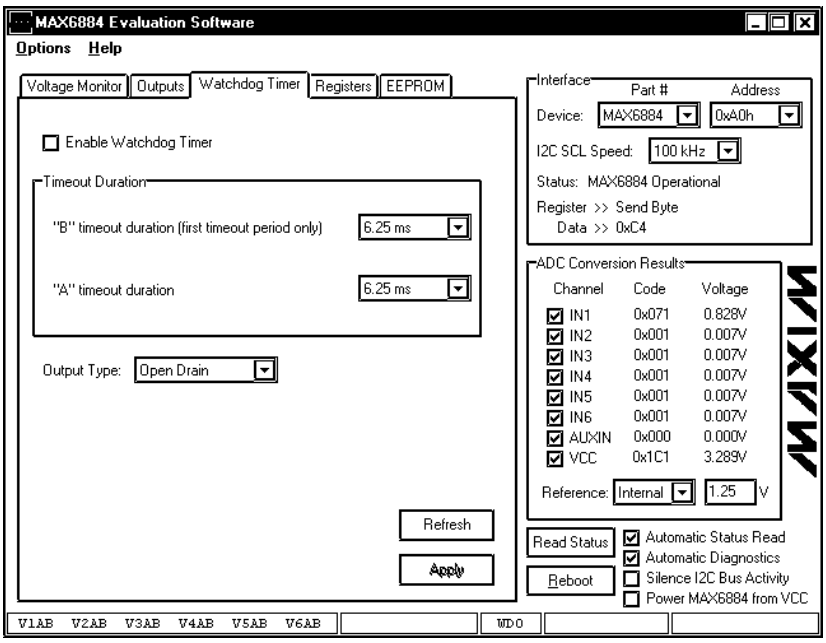

Figure 4. MAX6884 EV Kit Software Watchdog Timer Tab

Press the **Refresh** button to read the current values from the MAX6884. Press the **Apply** button to send the software values to the MAX6884.

Registers Tab

The **Registers** tab (Figure 5) displays the MAX6884 volatile working registers and their corresponding EEPROM value. Pressing **Refresh** reads and displays all register and EEPROM values. Individual register bytes can be modified by selecting the appropriate grid cell and typing two hexadecimal digits 0–9/A–F.

At power-up, the MAX6884 automatically loads its registers from the configuration EEPROM page. To store the active register values into the configuration EEPROM, press **Commit to EEPROM**. Prevent any software modifications to the configuration registers and configuration EEPROM by checking the **Lock Configuration** checkbox. Reset the **Confirm Write** checkbox to disable the register write confirmation.

Register values can optionally be stored into a text file on disk for later retrieval, using the **Load Reg Values from File** and **Save Reg Values to File** buttons.

EEPROM Tab

The **EEPROM** tab (Figure 6) displays the nonvolatile EEPROM memory contents of the MAX6884. Pressing **Refresh** reads and displays the EEPROM contents on the GUI. Individual memory bytes can be modified by selecting the appropriate grid cell and typing two hexadecimal digits 0–9/A–F.

To disregard user EEPROM (0x40h to 0x7Fh) writes when the $\overline{UV/OV}$ or $\overline{RESET}$ outputs are asserted, check **the EEPROM Write Depends on UV/OV** or **EEPROM Write Depends on RESET** checkboxes. Refer to the MAX6884 data sheet for more details. Reset the **Confirm Write** checkbox to disable the EEPROM write confirmation.

EEPROM values can optionally be stored into a text file on disk for later retrieval, using the **Load from File** and **Save to File** buttons.

Simple I²C Commands

There are two methods for communicating with the MAX6884: through the normal user-interface panel or through the I²C commands available by selecting the **2-Wire Interface Diagnostic** item from the **Options** pull-down menu. A window is displayed that allows I²C operations, such as Read Byte and Write Byte, to be executed. To stop normal user-interface execution so that it does not override the manually set values, turn off the update timer by unchecking the **Automatic Status Read** and **Automatic Diagnostics** checkboxes.

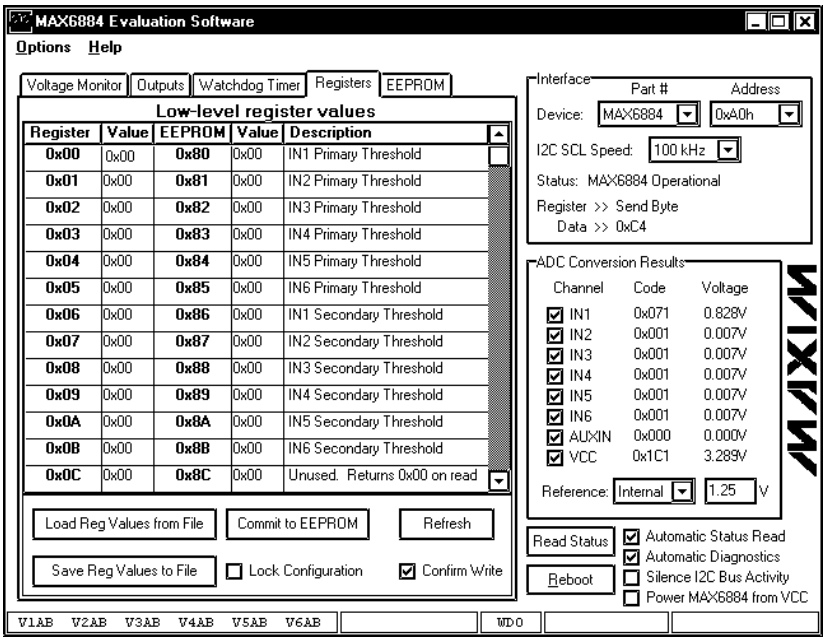

Figure 5. MAX6884 EV Kit Software Registers Tab

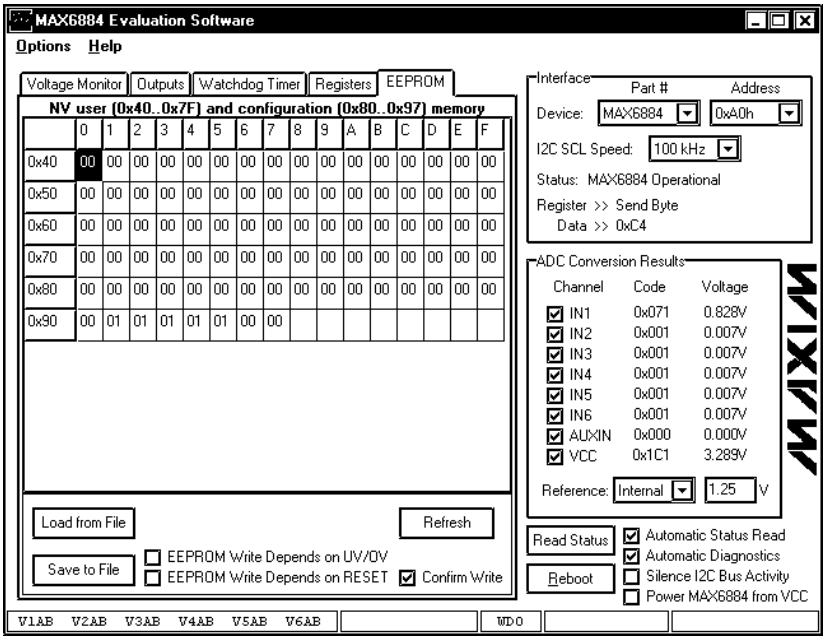

Figure 6. MAX6884 EV Kit Software EEPROM Tab

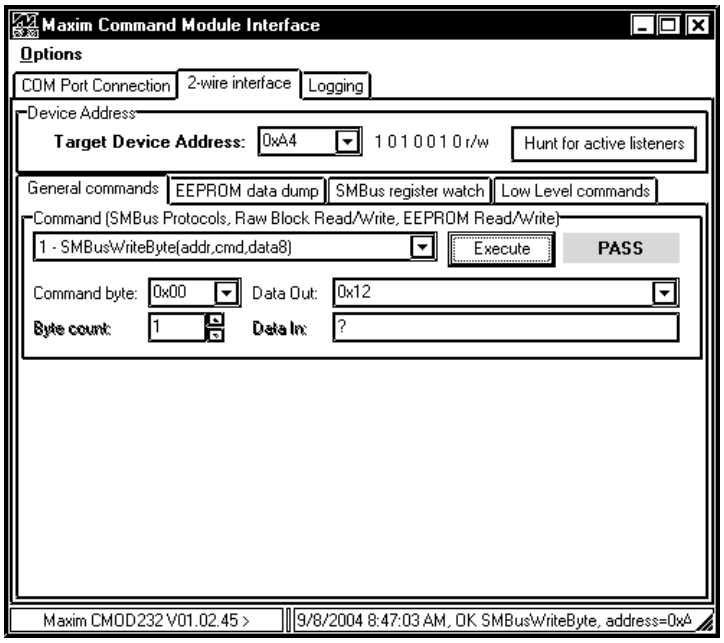

Figure 7. The above example shows a simple SMBusWriteByte operation using the included 2-Wire Interface Diagnostics. In this example, the software is writing data (0x12) to Device Address 0xA4, Register Address 0x00. This will set the primary undervoltage threshold for IN1A.

The I²C dialog boxes accept numeric data in binary, decimal, or hexadecimal. Hexadecimal numbers should be prefixed by $ or 0x. Binary numbers must be exactly eight digits. See Figure 7 for an example of this tool.

Note: In places where the slave address asks for an 8-bit value, it must be the 7-bit slave address of the MAX6884 as determined by ADD, with the last bit set to 1 for a read operation or a zero for a write. Refer to the MAX6884 data sheet for a complete list of registers and functions.

_Detailed Description of Hardware

The MAX6884 (U1) is surrounded by breakout header pins J1–J4. The user power-supply inputs IN1–IN6 are bypassed by capacitors C1–C6. Apply a 3.3V LED supply (optional) to the VLED and GND pads. Apply a V_{CC} supply (optional) to the VCC and GND pads. Monitor the MAX6884 outputs at the $\overline{RESET}$, $\overline{UV}/\overline{OV}$, and $\overline{WDO}$ pads. Apply a watchdog timer input at the WDI pad. A pushbutton switch (SW1) controls the manual reset input.

Address Selection

Jumper JU4 sets the MAX6884 I²C slave address. The default address is 1010 01XY (ADD = GND). See Table 1 for a complete list of addresses.

Note: The first 7 bits shown are the address. Y (bit 0) is the I²C read/write bit. This bit is a 1 for a read operation or a zero for a write.

Table 1. Shunt Settings for I²C Address (JU4)

SHUNT POSITION	MAX6884 ADDRESS PIN	MAX6884 ADDRESS	
		BINARY	HEXADECIMAL
1-2	VCC	1010 01XY	0xA4 or 0xA6
2-3*	GND	1010 00XY	0xA0 or 0xA2

X = Don't care (refer to MAX6884 data sheet for more details).
**Default configuration: JU4 (2-3).*

LED Indicator Control

The outputs ($\overline{RESET}$, $\overline{UV/OV}$, and $\overline{WDO}$) of the MAX6884 are connected to some general output circuitry. Jumpers JU1, JU2, and JU3, respectively, connect the outputs to either a pullup resistor attached to VLED or an LED indicator. See Table 2 for jumper settings.

Table 2. Output Control Circuitry (JU1, JU2, JU3)

SHUNT POSITION	DESCRIPTION
1-2	Output pulled up to VLED
2-3*	Output connected to LED indicator

**Default configuration: JU1 (2-3), JU2 (2-3), JU3 (2-3).*

$\overline{MARGIN}$ Input

The $\overline{MARGIN}$ input of the MAX6884 allows system testing when voltages are outside their normal ranges. JU5 controls this feature. It is expected that during normal operation the $\overline{MARGIN}$ function will be disabled. See Table 3 for jumper settings.

Table 3. $\overline{MARGIN}$ Input (JU5)

SHUNT POSITION	DESCRIPTION
Not Installed*	Normal operation
Installed	$\overline{RESET}$, $\overline{UV/OV}$, and $\overline{WDO}$ outputs held constant

**Default configuration: JU5 (not installed).*

Evaluating the MAX6885

The MAX6884 EV kit is also capable of evaluating the I²C-compatible MAX6885. To evaluate the MAX6885 replace the MAX6884 (U1) with a MAX6885ETP free sample. Select the MAX6885 option from the **Device, Part #** control located in the **Interface** box on the MAX6884 EV kit software.

Using an Alternative I²C Interface

The MAX6884 EV kit provides pads and pullup resistor placeholders that allow an alternative I²C-compatible interface to be used. Connect the interface through the SCL, SDA, and GND pads. Install pullup resistors at positions R7 and R8 if required.

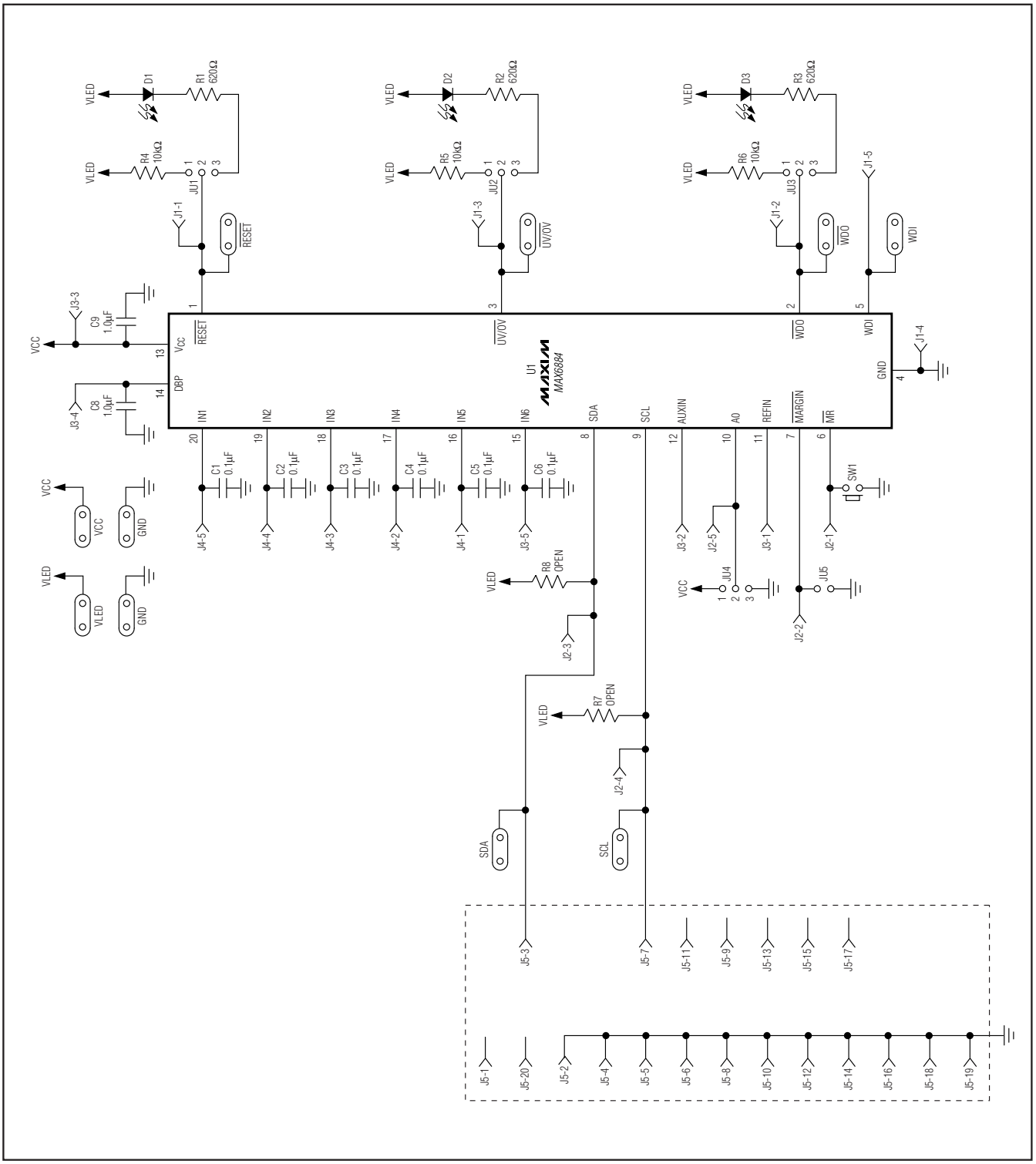

Figure 8. MAX6884 EV Kit Schematic

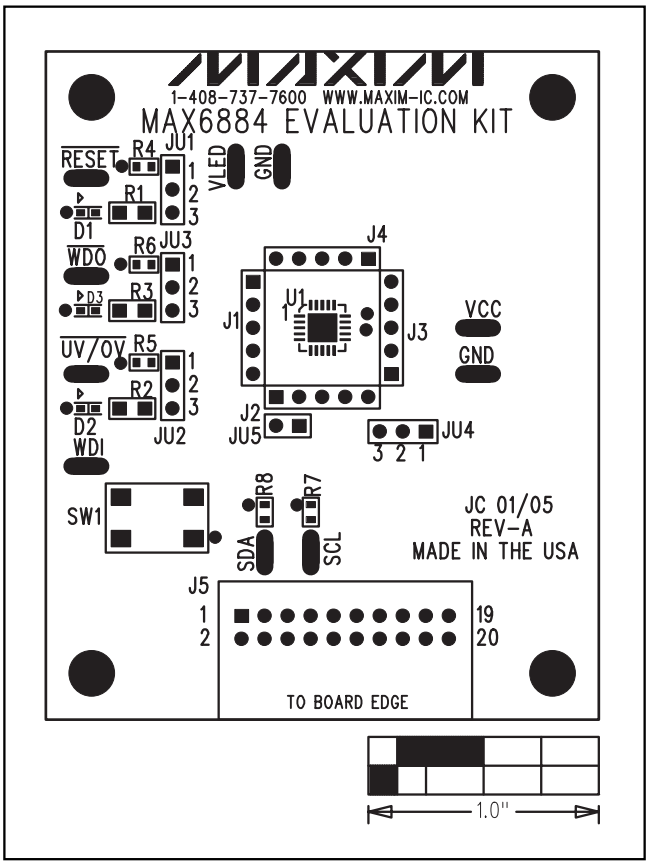

Figure 9. MAX6884 EV Kit Component Placement Guide—Component Side

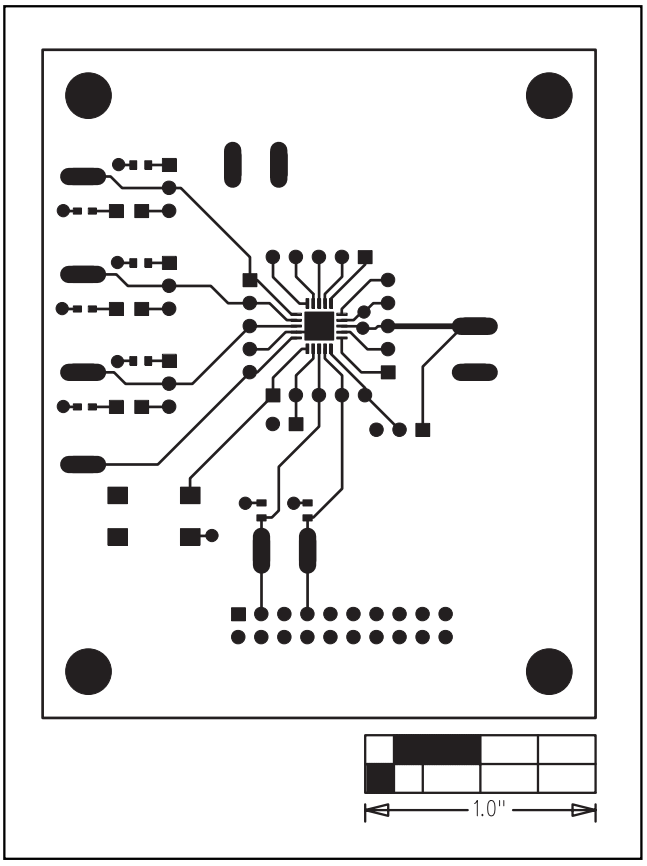

Figure 10. MAX6884 EV Kit PC Board Layout—Component Side

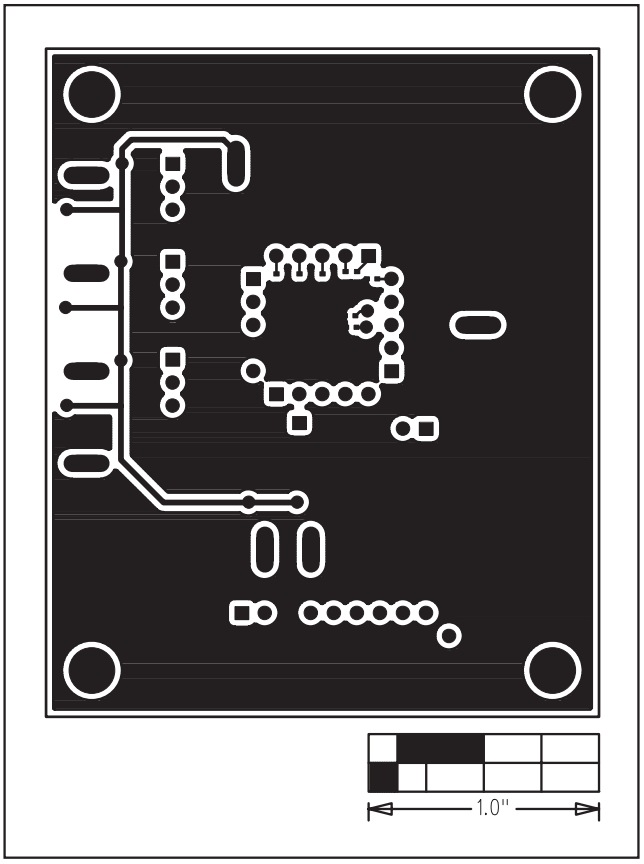

Figure 11. MAX6884 EV Kit PC Board Layout—Solder Side

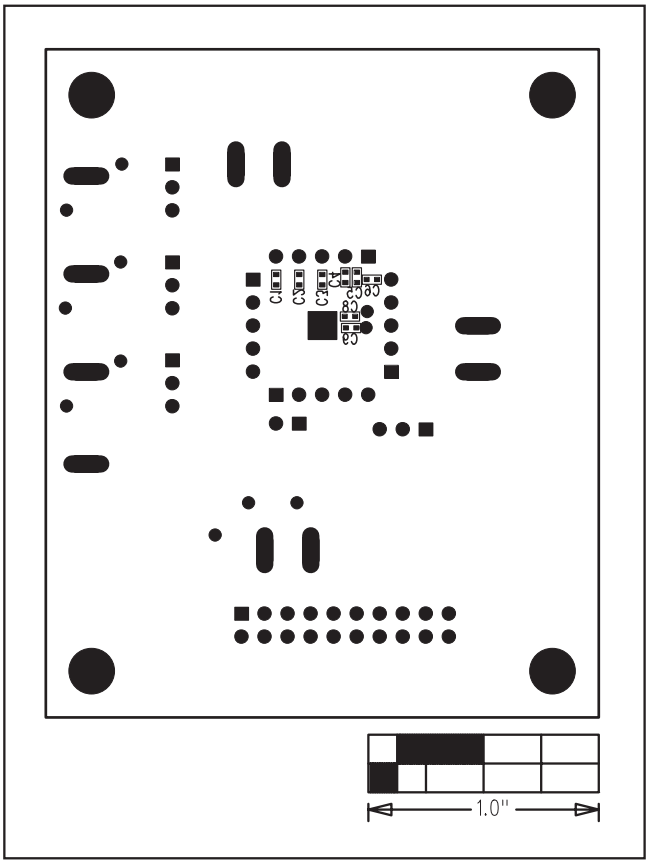

Figure 12. MAX6884 EV Kit Component Placement Guide—Solder Side