MAX6870 Evaluation Kit/ Evaluation System

Evaluate: MAX6870–MAX6875

General Description

The MAX6870 evaluation system (EV system) consists of a MAX6870 evaluation kit (EV kit) and a Maxim CMAXQUSB command module. The MAX6870 EEPROM-configurable, multivoltage supply sequencer/supervisor monitors several voltage-detector inputs, two auxiliary inputs, and four general-purpose logic inputs, and features programmable outputs for highly configurable power-supply sequencing applications. The evaluation software runs under Windows® 98/2000/XP, providing a handy user interface to exercise the features of the MAX6870.

Order the complete EV system (MAX6870EVCMAXQU) for comprehensive evaluation of the MAX6870 using a PC. Order the EV kit (MAX6870EVKIT) if the command module has already been purchased with a previous Maxim EV system, or for custom use in other µC-based systems.

This system can also evaluate the MAX6871–MAX6875. Contact factory for a free sample of MAX6871ETJ, MAX6872ETJ, MAX6873ETJ, MAX6874ETJ, or MAX6875ETJ.

MAX6870 Stand-Alone EV Kit

The MAX6870 EV kit provides a proven PC board layout to facilitate evaluation of the MAX6870. It must be interfaced to appropriate timing signals for proper operation. Connect power, ground return, and SCL/SDA interface signals to the breakout header pins (see Figure 9). The LEDs and load-switching FETs are optional circuits, which can be powered separately or disabled altogether. Refer to the MAX6870 data sheet for timing requirements.

MAX6870 EV System

The MAX6870 evaluation system software runs under Windows 98/2000/XP on an IBM-compatible PC, interfacing to the EV system board through the computer's USB port. See the *Quick Start* section for setup and operating instructions.

Features

- Proven PC Board Layout
- Complete Evaluation System
- Convenient On-Board Test Points
- Fully Assembled and Tested

Ordering Information

The MAX6870 EV software is designed for use with the complete EV system MAX6870EVCMAXQU (includes CMAXQUSB module together with MAX6870EVKIT).

PART	TEMP RANGE	INTERFACE TYPE
MAX6870EVCMAXQU#	0°C to +70°C	Windows software, USB

 # Denotes RoHS compliant with exemption.

Parts List

PART	QTY	DESCRIPTION
MAX6870EVKIT	1	MAX6870 evaluation kit
CMAXQUSB	1	Command module

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	1µF, 6.3V X7R ceramic capacitors (0603) TDK C1608X7R0J105K
C3–C7	5	0.1µF, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K
C8	0	Open (0603)
JU1–JU8	8	3-pin headers
JU9–JU14	0	Open
H1–H4	4	8-pin headers
D1	1	30V, 200mA Schottky diode (SOT23) Zetex BAT54CTA common cathode Diodes Incorporated BAT54C Fairchild BAT54C General Semiconductor BAT54C

Windows is a registered trademark of Microsoft Corp.

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
LED1–LED4, LED9, LED12, LED14, LED15	8	Red LEDs (T1-3/4)
LED5–LED8, LED10, LED11, LED13, LED16	8	Green LEDs (T1-3/4)
P1	1	2 x 10 right-angle receptacle
Q1–Q4	4	Logic-level FETs, 2.7A at 30V (SOT23) Fairchild FDN359AN

DESIGNATION	QTY	DESCRIPTION
R1, R2	2	100kΩ ±5% resistors (0805)
R3–R18	16	1kΩ ±5% resistors (0805)
R19	1	100Ω ±5% resistor (0805)
U1	1	MAX6870ETJ (32-pin QFN)
None	8	Shunts
None	1	PC board, MAX6870 EV kit

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Diodes Inc	805-446-4800	805-446-4850	www.diodes.com
Fairchild	888-522-5372	Local rep only	www.fairchildsemi.com
General Semiconductor	760-804-9258	760-804-9259	www.gensemi.com
TDK	847-803-6100	847-390-4405	www.component.tdk.com
Zetex USA	631-543-7100	631-864-7630	www.zetex.com

Note: *Indicate you are using the MAX6870 when contacting these component suppliers.*

Quick Start

Required Equipment

Before you begin, the following equipment is needed:

- Maxim MAX6870EVCMAXQU (contains MAX6870 EV kit board and CMAXQUSB module)
- Windows 98/2000/XP computer with a spare serial (COM) port
- 9-pin I/O extension cable.

Procedure

Do not turn on the power until all connections are made:

1) Ensure that JU-1-JU-8 are in the 1-2 position. Jumper sites JU-9-JU-14 are empty. See the *Jumper Function Tables* section.
2) Select 3.3V or 5.0V logic by setting the CMAXQUSB **VDD_SELECT** Jumper.
3) Carefully connect the boards by aligning the 20-pin header of the MAX6870 EV kit with the 20-pin connector of the CMAXQUSB module. Gently press them together. The two boards should be flush against one another.
4) Install the evaluation software on your computer by running the INSTALL.EXE program on the disk. The program files are copied and icons are created for them in the Windows Start menu.
5) Connect the USB cable between the CMAXQUSB and the computer. When you plug in the CMAXQUSB board for the first time, the windows plug-and-play system detects the new hardware and automatically runs the Add New Hardware Wizard. (If the Add New Hardware Wizard does not appear after a minute, unplug the board from the USB and plug it in again.) Make certain to specify the search location. Maxim software designed for CMAXQUSB includes a copy of the device driver in the installed software directory. Refer to *Application Note 3601: Troubleshooting Windows Plug-and-Play and USB for Maxim Evaluation Kits* for more details.
6) During device driver installation, Windows XP shows a warning message indicating that the device driver Maxim uses does not contain a digital signature. This is not an error condition. It is safe to proceed with the installation.
7) Start the MAX6870 program by opening its icon in the Start menu.

8) After the software locates the CMAXQUSB module and the MAX6870EVKIT board, the software polls the device status, updating the status bar.

Detailed Description of Software

Main Window

The evaluation software's main window shows a block diagram of the MAX6870, with many clickable features. Clicking on different parts of the block diagram leads to different feature tabs. Clicking **Back** returns to the main window's block diagram tab.

Configuration register changes made with the GUI are written when the **Apply** button is clicked. Configuration of the device may be reread by clicking **Refresh**.

Press function key F1 at any time to return to the block diagram tab sheet. Press function key F2 to pop up a window displaying registers pertinent to the selected feature. The software reads the data registers automatically, unless disabled by unchecking **poll inputs every 2s** under the **options** menu.

At startup, the evaluation software reads the device configuration from the device registers.

Voltage Monitor Tab

The **voltage monitor** tab configures voltage monitor thresholds, selects the internal or external reference voltage (if applicable), and displays ADC conversion results (if applicable).

To configure one of the IN1–IN6 pins as a window comparator, first set the primary threshold (A) to the lower limit, then set the secondary threshold (B) to the upper limit, and finally, configure the secondary threshold (B) as an overvoltage detector. When configuring a PO_output to respond to this fault as a window comparator, select both the A and the B thresholds.

When a voltage monitor detects 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.

The software uses the **reference voltage** value to calculate the threshold and ADC voltages.

The MAX6870 and MAX6871 include an analog-to-digital converter (ADC). The software automatically reads and displays channels selected under **ADC Conversion Results**.

Digital Inputs Tab

Digital inputs GPI1–GPI4 can be configured for active-high or active-low logic. When a GPI_ pin is configured active high, a logic-high level asserts the corresponding GPI_ condition in the fault register. This fault register status is displayed in the status bar.

Outputs Tab

The PO_ signals assert when a selected combination of other signals become asserted. Some PO_ signals allow only a single combination (i.e., a single product term), while other PO_ signals can be asserted by two different combinations (i.e., a sum of two product terms). The voltage monitors and the watchdog timers are internal signals. The GPI_ pins are external inputs. Additionally, one PO_ signal may depend on another PO_.

When a PO_ signal is asserted, several actions can occur. The corresponding PO_ pin can be driven to a high or low logic level. The pin driver can be configured as an open-drain or as a push-pull output. When in push-pull mode, several system power-supply voltages are available, including some charge-pump voltages that are higher than the IN_ voltages.

The user EEPROM pages can optionally be locked out when the PO_ is asserted.

The manual reset ($\overline{MR}$) input forces the PO_ signal to its asserted state. A programmable output cannot depend solely on $\overline{MR}$. Refer to the $\overline{MR}$ section of the MAX6870 data sheet.

The $\overline{MARGIN}$ signal allows user system testing by forcing the PO_ signal to a logic-high or logic-low state, or holding the previously determined state. It is generally expected that $\overline{MARGIN}$ will be high during normal operation.

Watchdog Timers Tab

A watchdog timer asserts a fault condition after a period of time, unless the timer is periodically reset by an input pin being toggled. This fault register status is displayed in the status bar as WD1 or WD2.

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

The initial timeout period can be set to a longer value to allow time for software initialization. Alternatively, the watchdog timer can be held in reset by an optional clear input.

Refer to the MAX6870 data sheet for more information about watchdog timer operation.

Registers Tab

The **Registers** tab displays the volatile working registers of the MAX6870. Pressing **Refresh** reads and displays all register values. Individual register bytes can be modified by selecting the appropriate grid cell and typing zero-x prefix (0x) followed by two hexadecimal digits 0–9/A–F. If **options** menu item **Confirm REG Write when editing** is checked, a dialog box appears to confirm each byte written in this manner.

At power-up, the MAX6870 automatically loads its registers from the configuration EEPROM page. To store the active register values into the configuration EEPROM, press **Commit to EEPROM**. The **Re-load from EEPROM** command sends 88h, rebooting the MAX6870.

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

EEPROM Tab

The **EEPROM** tab displays the nonvolatile EEPROM memory pages of the MAX6870. Pressing **Refresh** reads and displays the selected EEPROM page. Individual memory bytes can be modified by selecting the appropriate grid cell and typing zero-x prefix (0x) followed by two hexadecimal digits 0–9/A–F. If **options** menu item **Confirm EEPROM Write when editing** is checked, a dialog box appears to confirm each byte written in this manner.

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.

Detailed Description of Hardware

The MAX6870 (U1) is surrounded by breakout header pins H1–H4. Two internally generated voltage sources are bypassed by capacitors C1 and C2. The user power-supply inputs IN1 and IN3–IN6 are bypassed by capacitors C3–C7.

If an external reference is used, capacitor site C8 should be loaded with a suitable bypass capacitor. Otherwise, C8 can be left open.

Connector P1 mates with the CMAXQUSB module, which enables communication with software running on a PC. (There are SCL/SDA pullup resistors on the module board.) As a convenience, the module also provides 5V DC power to U1 through D1, R19, and jumper JU13. This same 5VDC power supply also powers most of the EV kit LEDs through jumper JU14.

Programmable outputs PO1–PO4 drive an optional load-switching demonstration circuit. User-provided power supplies at IN3–IN6 can drive loads OUT3, OUT4, OUT5, and OUT6. The circuit can be demonstrated using LED10, LED11, LED13, LED16 as onboard loads, or by connecting external loads to the OUT3–OUT6 oval pads. Q1–Q4 are susceptible to ESD damage if gates are left floating.

Programmable outputs PO5–PO8 can be configured to drive LED indicators.

Evaluating the MAX6871–MAX6875

With power off, replace U1 with a MAX6871ETJ, MAX6872ETJ, MAX6873ETJ, MAX6874ETJ, or MAX6875ETJ. The software automatically detects the device type and disables unused features accordingly.

Diagnostics Window

The diagnostics window is used for factory testing prior to shipping the evaluation kit. It is not meant for customer use.

Jumper Function Tables

Tables 1–13 are jumper function tables.

Table 1. Jumper JU1

JU1 SHUNT POSITION	FUNCTION
Open	PO1 available for user circuitry. LED11, LED12, OUT3, Q2 disconnected.
1-2	PO1 low lights LED12; Q2 gate is left floating.
2-3*	PO1 high turns on Q2, connecting OUT3to IN3. LED11 lights if IN3 > 3V.

**Indicates default configuration, set by an installed shunt.*

Table 2. Jumper JU2

JU2 SHUNT POSITION	FUNCTION
Open	PO2 available for user circuitry. LED9, LED10, OUT4, Q1 disconnected.
1-2	PO2 low lights LED9; Q1 gate is left floating.
2-3*	PO2 high turns on Q1, connecting OUT4 to IN4. LED10 lights if IN4 > 3V.

**Indicates default configuration, set by an installed shunt.*

Table 3. Jumper JU3

JU3 SHUNT POSITION	FUNCTION
Open	PO3 available for user circuitry. LED14, LED13, OUT5, Q3 disconnected.
1-2	PO3 low lights LED14; Q3 gate is left floating.
2-3*	PO3 high turns on Q3, connecting OUT5 to IN5. LED13 lights if IN5 > 3V.

**Indicates default configuration, set by an installed shunt.*

Table 4. Jumper JU4

JU4 SHUNT POSITION	FUNCTION
Open	PO4 available for user circuitry. LED15, LED16, OUT6, Q4 disconnected.
1-2	PO4 low lights LED15; Q4 gate is left floating.
2-3*	PO4 high turns on Q4, connecting OUT6 to IN6. LED16 lights if IN6 > 3V.

**Indicates default configuration, set by an installed shunt.*

Table 5. Jumper JU5

JU5 SHUNT POSITION	FUNCTION
Open	PO5 available for user circuitry.LED1, LED8 disconnected.
1-2*	PO5 low lights LED1.
2-3	PO5 high lights LED8 (unless configured in open-drain modeor insufficient pullup source voltage).

**Indicates default configuration, set by an installed shunt.*

Table 6. Jumper JU6

JU6 SHUNT POSITION	FUNCTION
Open	PO6 available for user circuitry.LED2, LED7 disconnected.
1-2*	PO6 low lights LED2.
2-3	PO6 high lights LED7 (unless configured in open-drain modeor insufficient pullup source voltage).

**Indicates default configuration, set by an installed shunt.*

Table 7. Jumper JU7

JU7 SHUNT POSITION	FUNCTION
Open	PO7 available for user circuitry.LED3, LED6 disconnected.
1-2*	PO7 low lights LED3.
2-3	PO7 high lights LED6 (unless configured in open-drain mode or insufficient pullup source voltage).

**Indicates default configuration, set by an installed shunt.*

Table 8. Jumper JU8

JU8 SHUNT POSITION	FUNCTION
Open	PO8 available for user circuitry.LED4, LED5 disconnected.
1-2*	PO8 low lights LED4.
2-3	PO8 high lights LED5 (unless configured in open-drain modeor insufficient pullup source voltage).

**Indicates default configuration, set by an installed shunt.*

Table 9. Jumpers JU9, JU10 (Device Address Selection)

JU9 SHUNT POSITION	JU10 SHUNT POSITION	A0	A1	DEVICE ADDRESS
Closed*	Closed*	0	0	1010 00x r/w
Open	Closed	1	0	1010 01x r/w
Closed	Open	0	1	1010 10x r/w
Open	Open	1	1	1010 11x r/w

**Indicates default configuration, which is a trace on the PC board.*

Table 10. Jumper JU11 ($\overline{\text{MR}}$)

JU11 SHUNT POSITION	$\overline{\text{MR}}$	FUNCTION
Open*	1	Normal operation
Closed	0	Manual reset

**Indicates default configuration.*

Table 11. Jumper JU12 ($\overline{\text{MARGIN}}$)

JU12 SHUNT POSITION	$\overline{\text{MARGIN}}$	FUNCTION
Open*	1	Normal operation.
Closed	0	User test mode: PO outputs are set to their configured $\overline{\text{MARGIN}}$ state. Refer to the MAX6870 data sheet.

**Indicates default configuration.*

Table 12. Jumper JU13 (Device Power)

JU13 SHUNT POSITION	FUNCTION
Open	U1 must be powered by a user-supplied external supply connected to IN1, IN3–IN6.
Closed*	U1 input IN1 is powered from connector P1 5V supply (the CMAXQUSB module).

**Indicates default configuration, which is a trace on the PC board.*

Table 13. Jumper JU14 (LED Power)

JU14 SHUNT POSITION	FUNCTION
Open	LED1–LED16 are unused, or can be externally powered.
Closed*	LED1–LED16 are powered from connector P1 5V supply (the CMAXQUSB module).

**Indicates default configuration, which is a trace on the PC board.*

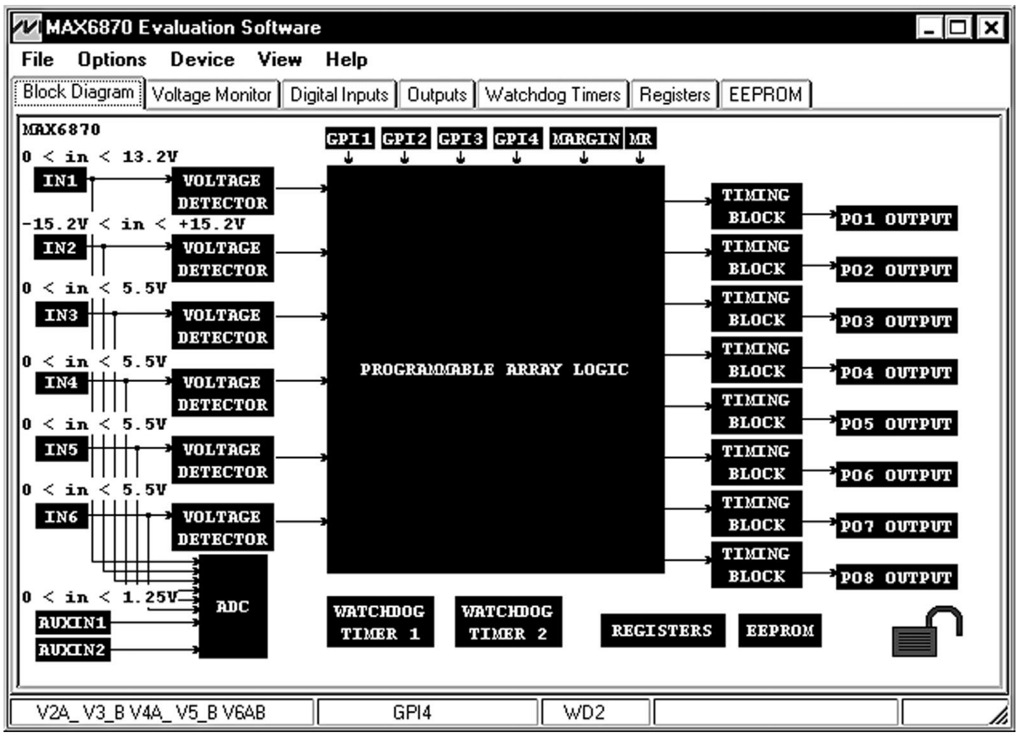

Figure 1. Block Diagram (Can Be Brought Up Anytime by Pressing Function Key F1)

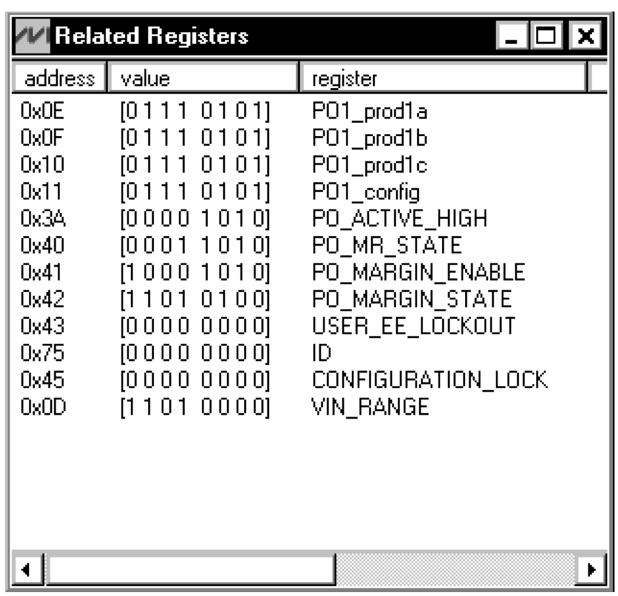

Figure 2. Related Registers Adjunct Window (Shown by Pressing Function Key F2)

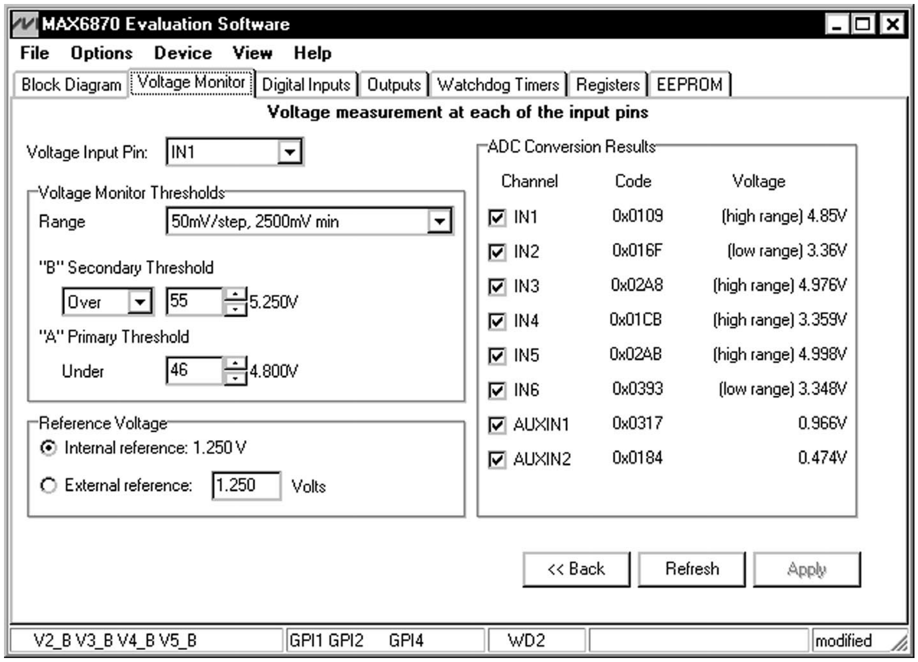

Figure 3. Voltage Monitor Tab

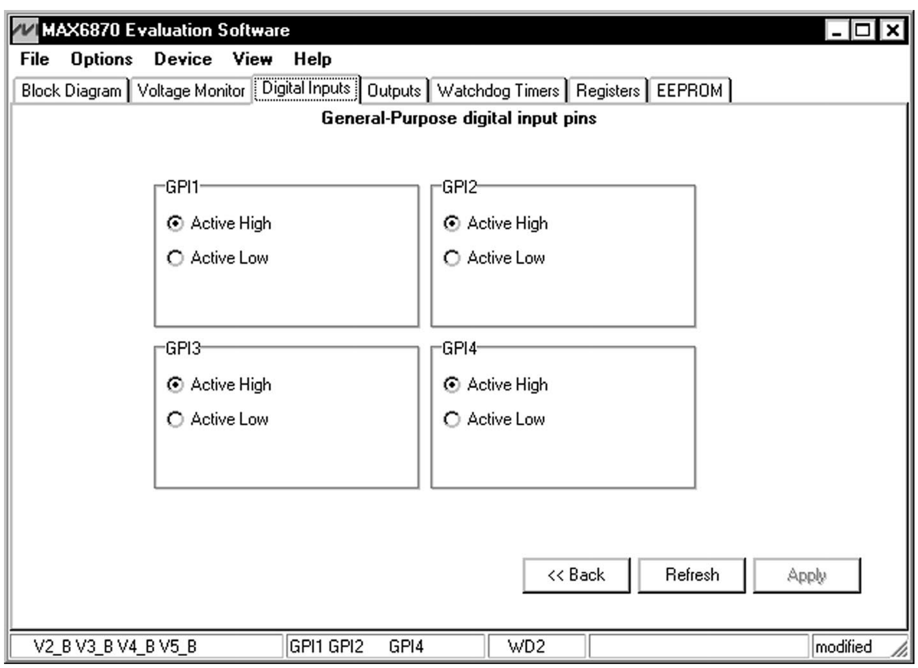

Figure 4. Digital Inputs

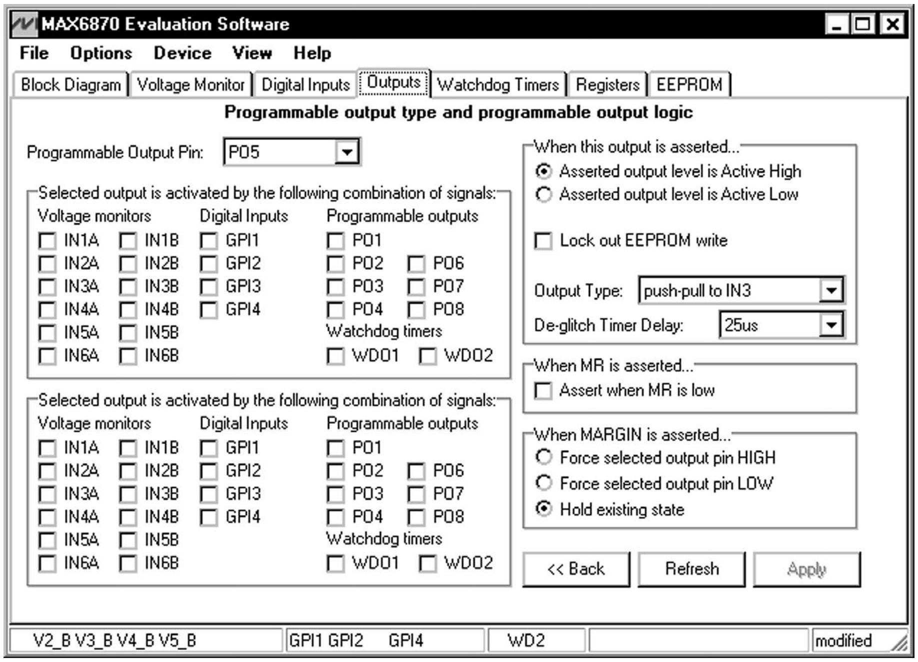

Figure 5. Programmable Outputs

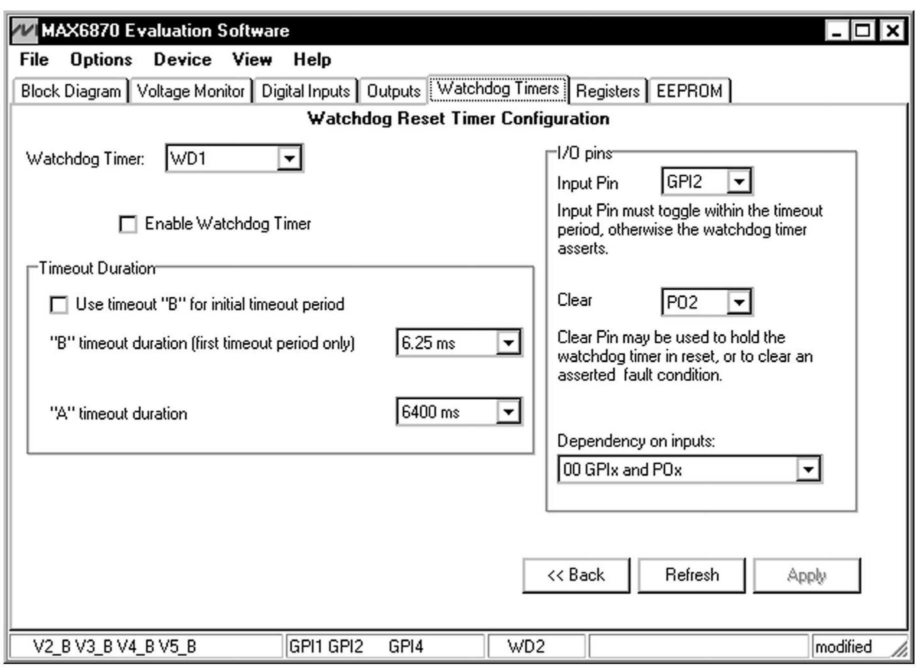

Figure 6. Watchdog Timers

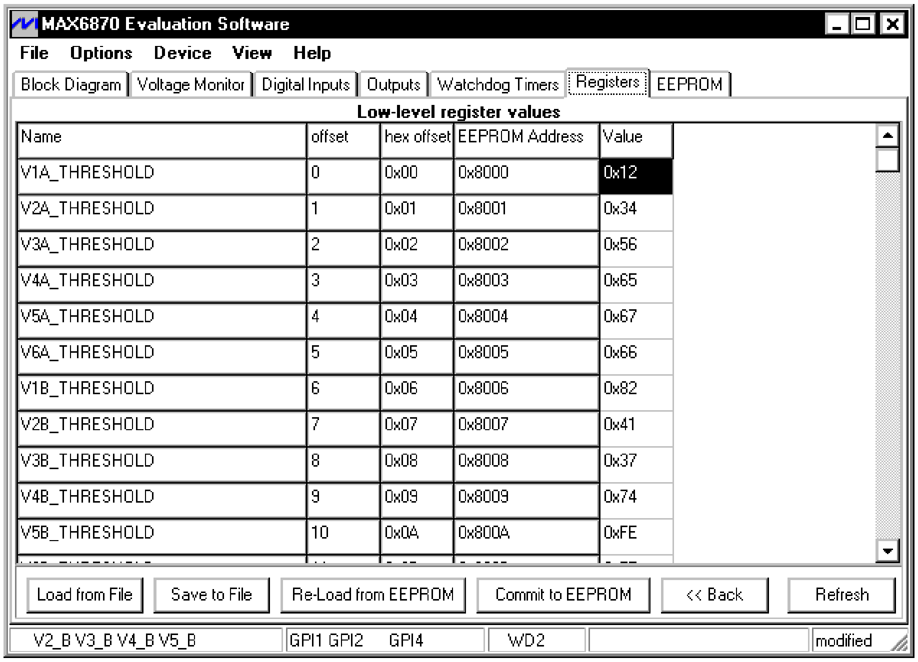

Figure 7. Registers

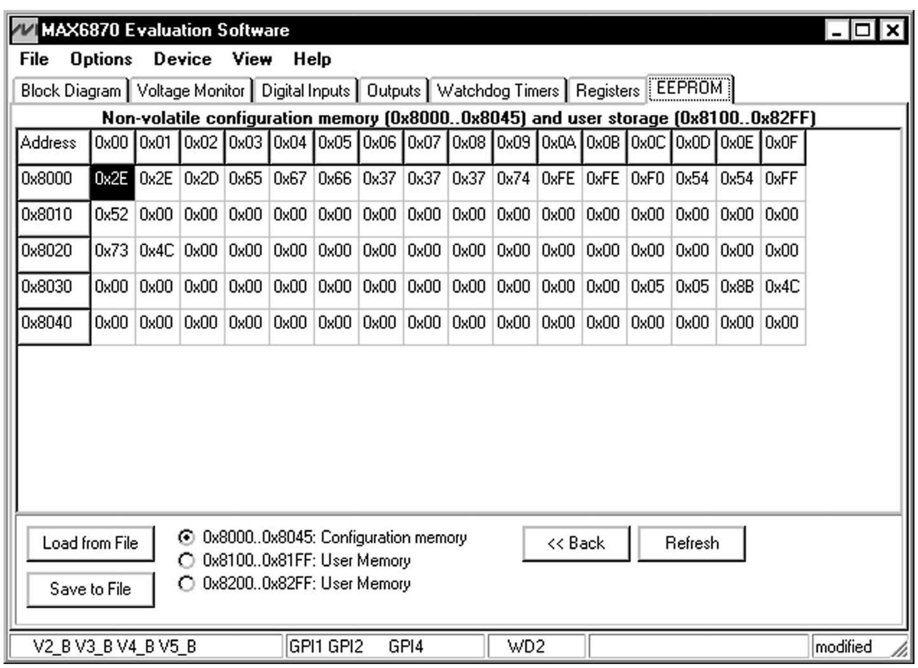

Figure 8. EEPROM Memory

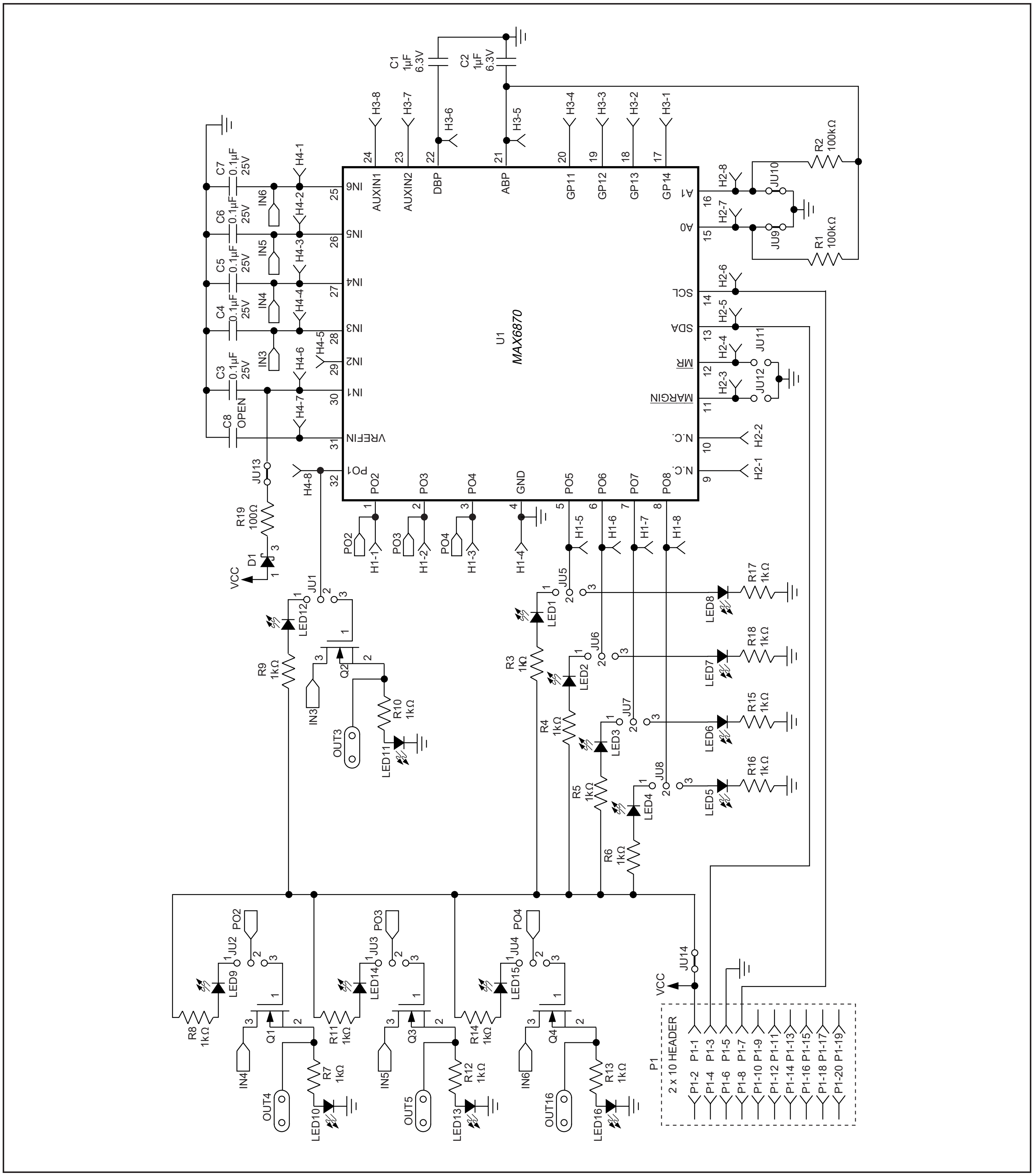

Figure 9. MAX6870 EV Kit Schematic

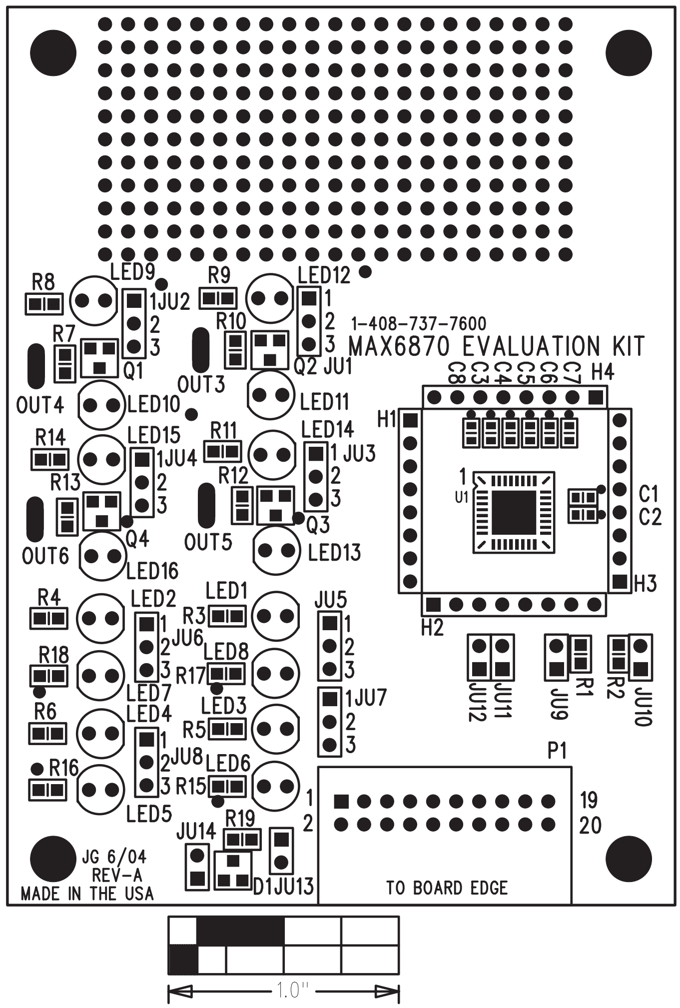

Figure 10. MAX6870 EV Kit Component Placement Guide—Component Side

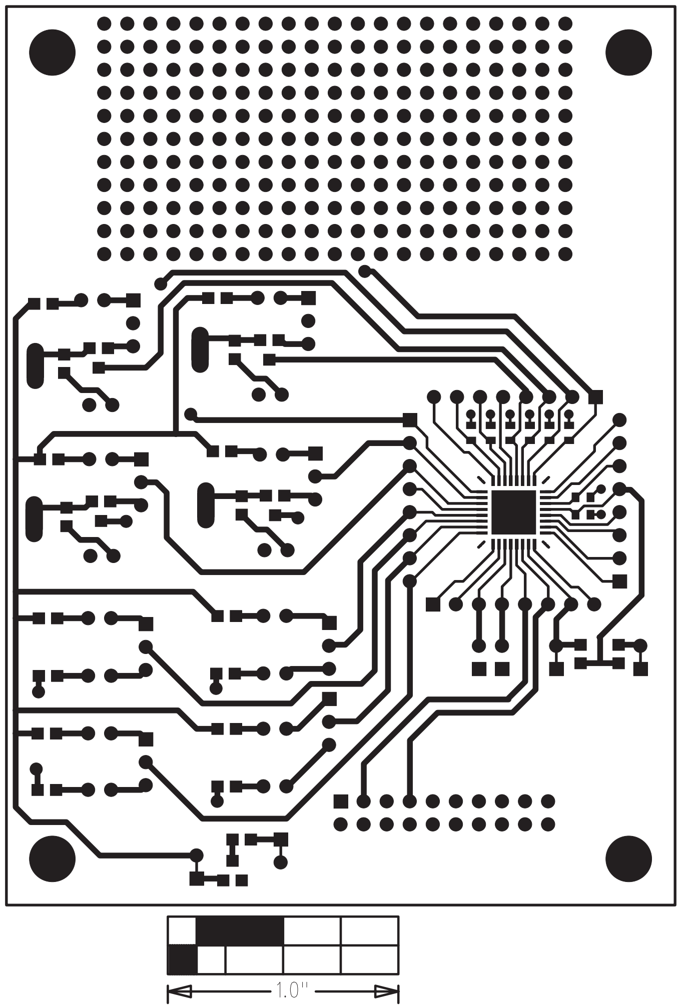

Figure 11. MAX6870 EV Kit PC Board Layout—Component Side

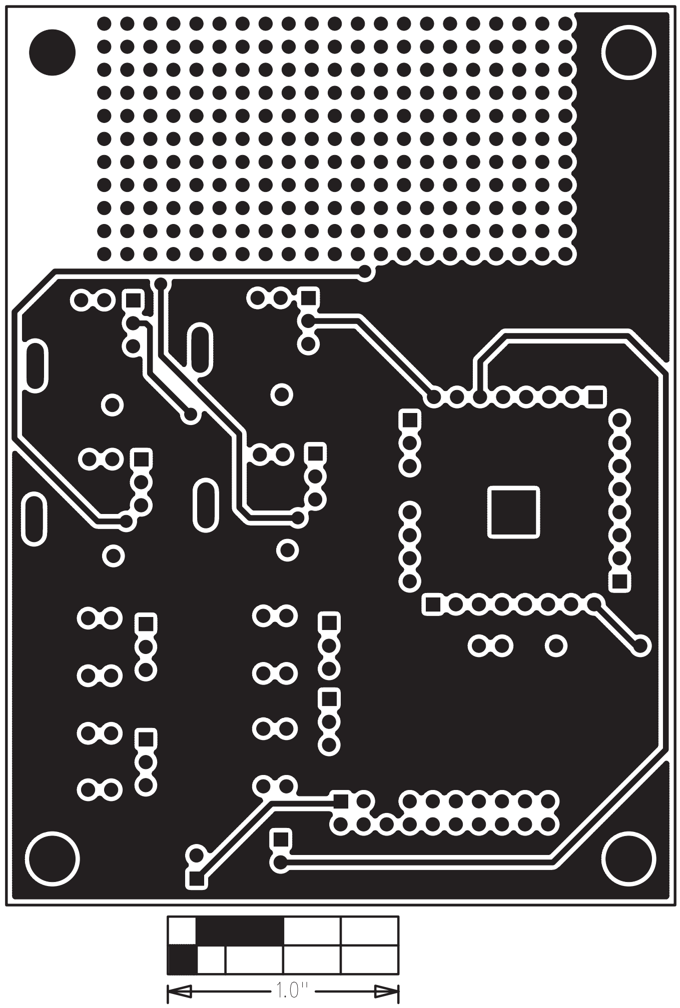

Figure 12. MAX6870 EV Kit PC Board Layout—Solder Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/04	Initial release	—
1	8/05	Replace CMOD232 with CMAXQUSB	1, 2
2	1/21	Updated *Ordering Information* table	1
3	3/21	Updated *Ordering Information* table	1

