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MAX6876 Evaluation Kit/Evaluation System

Evaluate: MAX6876

General Description

The MAX6876 evaluation system (EV system) consists of a MAX6876 evaluation kit (EV kit) and a Maxim CMOD232 command module. The MAX6876 EEPROM-programmable quad power-supply tracker/sequencer circuit monitors four system voltages and ensures proper power-up and power-down conditions for systems requiring voltage tracking and/or sequencing.

The evaluation software (EV software) runs under Windows® 98/2000/XP, providing a convenient user interface to exercise the features of the MAX6876.

Order the complete EV system (MAX6876EVCMOD2) for a comprehensive evaluation of the MAX6876 using a PC. Order just the EV kit (MAX6876EVKIT) if the command module has already been purchased with a previous Maxim EV system, or if the EV kit is desired for custom development in conjunction with other microcontroller-based systems.

This evaluation system data sheet assumes the reader has a basic familiarity with the MAX6876 IC. Refer to the MAX6876 IC data sheet for detailed specifications and operating instructions.

MAX6876 Stand-Alone EV Kit

The MAX6876 EV kit provides a proven PC board layout to facilitate evaluation of the MAX6876. It must be interfaced to appropriate serial communication signals for proper operation. Connect power, ground return, and SCL/SDA interface signals to the breakout header pins (see Figure 3). The load-switching FETs can control up to four supply rails. Refer to the MAX6876 IC data sheet for serial-data timing and electrical requirements.

MAX6876 EV System

The MAX6876 EV system software runs under Windows 98/2000/XP on an IBM-compatible PC, interfacing to the EV system through the computer's serial communications port. See the *Quick Start* section for setup and operating instructions.

MAX6876 EV System Component List

PART	QTY	DESCRIPTION
MAX6876EVKIT	1	MAX6876 evaluation kit
CMOD232	1	Command module
MAX6876 EV Kit Software	1	User-interface software

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Features

♦ **Proven PC Board Layout**

♦ **Complete Evaluation System**

♦ **Convenient On-Board Test Points and Connectors**

♦ **Fully Assembled and Tested**

Ordering Information

PART	TEMP RANGE	INTERFACE TYPE
MAX6876EVKIT	0°C to +70°C	User supplied
MAX6876EVCMOD2	0°C to +70°C	Windows software, RS-232 port

Note: *The MAX6876 evaluation software is designed for use with the complete EV system MAX6876EVCMOD2 (includes CMOD232 module together with MAX6876EVKIT). If the MAX6876 EV software will not be used, the MAX6876EVKIT board can be purchased by itself without the CMOD232 module.*

MAX6876 EV Kit Component List

DESIGNATION	QTY	DESCRIPTION
C1–C4	4	10µF ceramic capacitors KEMET C0805C106K9PACTU
C5–C8	0	Not installed Nichicon UUD1H221MNL1GS
C9–C12	0	Not installed KEMET C0805C106K9PACTU
C13–C16	4	1µF ceramic capacitors KEMET C0805C105K8RACTU
CR1–CR6	6	1206 surface-mount LEDs Fairchild Semiconductor QTLP650D4TR
J1–J9, J11, J12	11	Banana plug receptacles Keystone Electronics 6095
J10	1	20-pin right-angle header Samtec SSW-110-02-S-D-RA
JMP1, JMP2, JMP6	3	3-pin headers, 0.1in centers Samtec TSW-103-07-F-S
JMP3, JMP4, JMP5, JMP7	4	2-pin headers, 0.1in centers Samtec TSW-102-07-F-S
Q1–Q4	4	20V logic-level n-channel MOSFETs International Rectifier IRLR3714Z

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MAX6876 Evaluation Kit/Evaluation System

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R1	0	Surface-mount resistor (0805) (not installed)
R2	0	Surface-mount resistor (0805)) (not installed)
R3–R6, R12–R15, R17	9	100kΩ surface-mount resistors (0805) Panasonic ERJ-6GEYJ104V
R7–R11	5	750Ω surface-mount resistors (0805) Panasonic ERJ-6GEYJ751V

DESIGNATION	QTY	DESCRIPTION
R16, R18	2	10kΩ surface-mount resistors (0805) Panasonic ERJ-6GEYJ103V
SW1	1	Tactile switch, J-lead, E-switch TL3301NF160QJ
TP1–TP23	23	Triple-turret terminals Keystone Electronics 1598-2
U1	1	MAX6876 power-supply sequencer Maxim MAX6876ETX

Component Suppliers

SUPPLIER	PHONE	WEBSITE
E-Switch	763-504-3525	www.e-switch.com
Fairchild Semiconductor	800-341-0392	www.fairchildsemiconductor.com
International Rectifier	310-252-7105	www.irf.com
KEMET	864-963-6300	www.kemet.com
Keystone Electronics	718-956-8900	www.keyelco.com
Nichicon	858-824-1515	www.nichicon-us.com
Panasonic	800-344-2112	www.panasonic.com/industrial
Samtec	800-726-8329	www.samtec.com

Note: *Indicate that you are using the MAX6876 when contacting these component suppliers.*

Quick Start

Required Equipment

Before you begin, the following equipment is needed:

- Maxim MAX6876EVCMOD2 (contains MAX6876 EV kit board and CMOD232 module)
- DC power supply, 9V DC at 200mA (included with CMOD232 module)
- Windows 98/2000/XP computer with an available serial (COM) port
- Standard 9-pin female-to-male straight-through serial cable
- DC power supplies capable of providing 0 to 5V for up to four channels of sequenced and/or tracked power through the MAX6876 EV system. (Power-supply current requirements depend on user configuration and application.)
- Test leads with 0.175in banana plugs to connect the MAX6876 EV kit board to power supplies

Procedure

Do not turn on any power supplies until all connections are completed:

1) Set JMP1 to the 2-3 position for normal UVLO operation. See Table 1. If JMP1 is set to the 1-2 position, install appropriate resistors at R1 and R2 to set the desired UVLO voltage.

2) Set JMP2 to the 1-2 position to enable voltage tracking/sequencing. Leaving JMP2 open allows remote hardware control of the ENABLE pin through the CMOD232 module. See Table 2.

3) Ensure JMP3 is not shorted for normal operation (non-MARGIN functionality). See Table 3.

4) Ensure that shorting links at JMP4 and JMP5 are installed to set the desired I2C address as shown in Table 4. The MAX6876 EV kit I2C address must correspond with the I2C address set in the evaluation software.

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5) Set JMP6 to provide either V_{CC} or ABP voltage to the V_{LOGIC} net. The V_{LOGIC} net must be connected to ABP if the MAX6876 is to be powered from one of the voltage-detector inputs (IN1–IN4), and the CMOD232 module is not connected (or if JMP7 is open). See Figure 3 and Table 5 for JMP6 settings. Be sure to remove resistors R7–R10 if V_{LOGIC} is to be connected to ABP. Refer to the ABP section of the MAX6876 IC data sheet.

6) Place a shorting link at JMP7 if the MAX6876EVKIT logic is to be powered from the CMOD232 module. This connects the CMOD232 +5V supply to the V_{LOGIC} net of the MAX6876EVKIT. See Figure 3 and Table 6.

7) Carefully connect the EV kit and CMOD232 module by aligning and fully mating the 20-pin header and socket, P3 of the CMOD232 module and J10 of the MAX6876EVKIT.

8) Connect a cable from the computer serial port to the CMOD232 module. If using a 9-pin serial port, use a straight-through female-to-male cable. If the PC has a 25-pin serial connector, a standard 25-pin to 9-pin adapter is required.

9) Install the evaluation software on your computer by running the INSTALL.EXE program on the CD. The program files are copied and icons are created in the Windows Start menu.

10) Connect the DC power supply to the CMOD232 module at input jack P1.

11) Start the MAX6876 evaluation software by clicking the program icon in the Start menu.

Detailed Description of Software

Connecting to the MAX6876EVKIT

To connect to the MAX6876 EV kit, ensure that header P3 of the CMOD232 module is plugged into J10 of the MAX6876 EV kit and that both boards have power.

Note: Power can be supplied to the MAX6876 EV kit from the CMOD232 module by installing a shorting link at JMP7. This shorting link must be removed if the MAX6876 EV kit is to operate from another supply voltage.

Connect the CMOD232 module to an available serial port on your PC using a standard straight-through female-to-male 9-pin cable. Set jumpers JMP4 and JMP5 on the MAX6876 EV kit to select the desired I2C address, per Table 4.

Click the system menu on the MAX6876 EV software and select **Connect**. A dialog box opens with pulldown menus for COM port selection and I2C slave address. Alternatively, clicking the **Auto Detect** checkbox causes the EV software to search serial ports COM1–COM4 and valid I2C addresses for a MAX6876 EV kit. Click the **Connect** button for the EV software to establish I2C communication. If connection cannot be established, recheck electrical connections, COM port assignment, and the I2C slave address.

After the evaluation software locates the CMOD232 module and the MAX6876EVKIT board, the software polls the configuration registers and updates the display every 500ms to reflect the current configuration.

Overview Tab

The evaluation software **Overview** tab shows a graphical representation of the four available power-supply IN_/OUT_ pairs, with many mouse-sensitive features. Figure 1 shows the appearance of the **Overview** tab for a typical configuration.

Clicking and dragging any of the four power-supply ramp waveforms allows OUT_ tracking assignment to each of the four sequential ramps. The undervoltage/overvoltage thresholds for each IN_/OUT_ pair can be adjusted graphically or with the keyboard. To enter the undervoltage or overvoltage thresholds using the keyboard, click the numeric threshold values on the left side of the **Overview** tab and a dialog box will open. This dialog box also allows selection of the threshold increments, either 10mV or 20mV.

Underlined text on the **Overview** tab is used to represent configuration register values that can be adjusted by selecting from a pulldown list. Other features, such as **Fault Behavior** and **Power-Down Mode**, are configured by radio buttons. The graphical representation of the IN_/OUT_ pairs changes to reflect **Simultaneous-** or **Reverse-Order Power-Down Mode**.

For each IN_/OUT_ pair, a checkbox allows selection of the 100Ω **Pulldown** resistance, and the adjustable **Overcurrent Threshold** can also be enabled or disabled for each pair. Checking the **Overcurrent Threshold** box for an IN_/OUT_ pair causes that channel to assert the OC output if the OUT_ voltage drops below the selected overcurrent threshold percentage. The **Assert RESET** checkboxes determine which OUT_ detectors assert the **RESET** output.
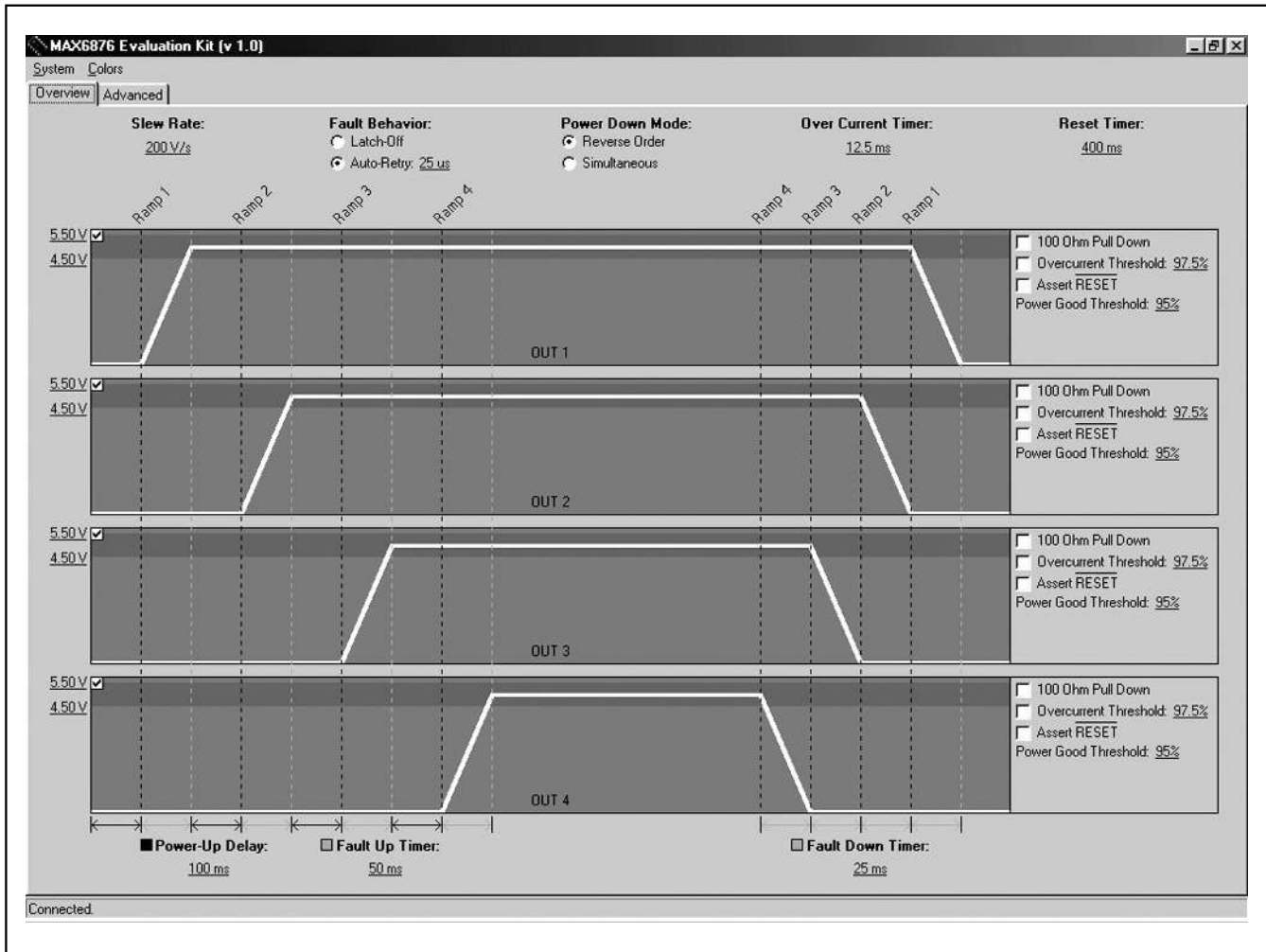
Figure 1. Evaluation Software Overview Tab

Any changes made to the configuration parameters on the **Overview** tab result in a corresponding change in the MAX6876 configuration registers for the connected MAX6876 EV kit. If configuration changes are made and no MAX6876 EV kit is connected, a warning dialog box will appear. Any changes made while disconnected are lost when connection is established.

Advanced Tab

The **Advanced** tab provides a detailed indication of the current **Register Values** in a table format. Values can be changed by selecting the appropriate field with the mouse cursor. Values are shown for both the volatile configuration registers and the corresponding non-volatile EEPROM locations. Figure 2 shows the appear-ance of the **Advanced** tab for a typical configuration.

Configuration register values can be stored in the con-figuration EEPROM by clicking on the **Commit Configuration** button. Clicking the **Locked** checkbox disables both register and EEPROM writes by setting bit 2 of register 13h. To lock the EEPROM values, set bit 2 of EEPROM location 33h.

Note: To unlock the EEPROM, first clear bit 2 of config-uration register 13h, then clear bit 2 of EEPROM loca-tion 33h.

The **Input Pin's State** box allows software remote con-trol of the logic-level voltage applied by the CMOD232 module to the MARGIN, ENABLE, and MR pins of the
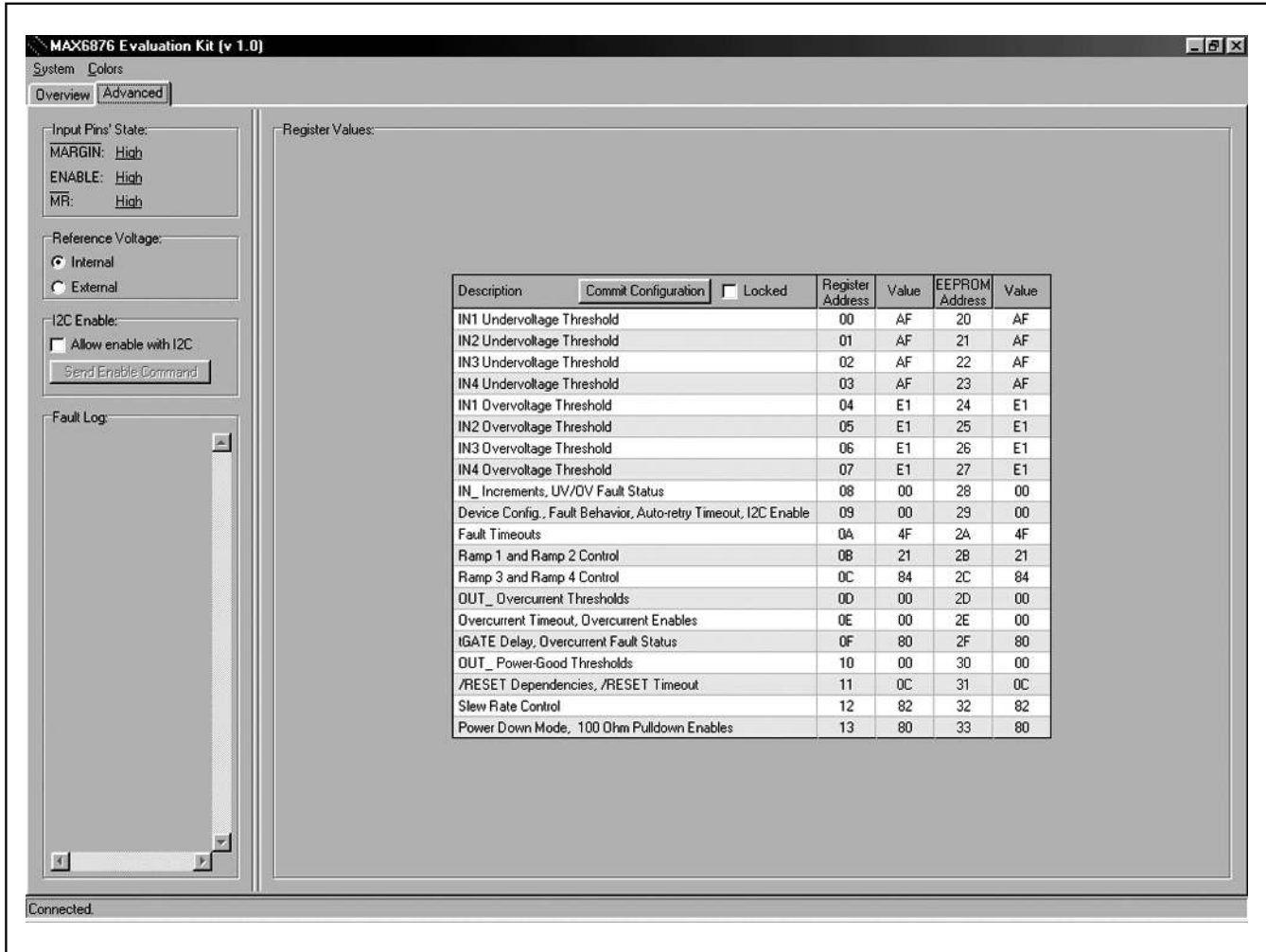
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Figure 2. Evaluation Software Advanced Tab

MAX6876, as long as the shorting links on JMP3 and JMP2 are not installed. Physical jumper settings override any selections made in this box.

The MAX6876 can be configured to use its internal reference voltage or an external reference by selecting the appropriate radio button in the **Reference Voltage** box. If you choose to use an external reference, be sure to physically connect a precision voltage source at test point TP16 on the MAX6876 EV kit board. Selecting external reference while none is connected causes the part to repeatedly enter fault condition.

The I^{2}C **Enable** box allows or prevents power sequencing/tracking to be enabled through the I^{2}C interface. By clicking the **Allow enable with I^{2}C** checkbox, power sequencing/tracking can be enabled or disabled by

clicking the **Send Enable Command** button. If the **Allow enable with I^{2}C** checkbox is not checked, the MAX6876 ignores the I^{2}C enable command bit. When I^{2}C enable is allowed by setting register 09h bit to 1, the MAX6876 internal ENABLE is the result of an AND condition between the I^{2}C command bit (register 09h, bit 0) and the logic ENABLE input at pin 11. Refer to the logic ENABLE diagram in the MAX6876 data sheet.

The **Fault Log** box records the most recently detected fault states. If the **Fault Log** box is full, a scrollbar allows review of up to 1024 past fault messages. The date and time data are from the PC clock.

System Menu

The **System** menu is used to initiate the serial communication connection between the MAX6876 EV kit board and the evaluation software. It can also be used to assert a software reset of the MAX6876 by selecting the **Reboot Target** option. Other functions available from the **System** menu include **Commit Configuration to EEPROM** and **Lock Configuration**, both of which are functionally equivalent to their corresponding controls on the **Advanced** tab.

Evaluation software configuration values can also be saved to disk for future reference. Opening a saved configuration file restores the previously saved configuration values to the registers of the connected MAX6876 EV kit.

Colors Menu

The **Colors** menu selections and dialog boxes allow the user to adjust evaluation software display colors to suit individual preference. Be sure to choose contrasting colors so that all display features remain visible.

Detailed Description of Hardware

The MAX6876 (U1) is mounted on an evaluation board that includes all necessary support components for a typical application circuit. The user power-supply input (V$_{CC}$, banana jack J12) is bypassed near U1 by 1µF capacitor C13, and the internal supply voltage is bypassed by 1µF capacitor C14.

The controlled IN_/OUT_ pairs are each bypassed with 10µF capacitors C1–C4. Additional surface-mount component leads are included for larger bypass caps if desired, such as C5–C8. The OUT_ voltages are similarly provided with surface-mount lands for capacitors C9–C12. Capacitors C5–C8 and C9–C12 are not installed in the default configuration of the EV kit board, and are not required in most applications.

Table 1. Jumper JMP1, TRKEN

JMP1 SHUNT POSITION	FUNCTION
1-2	Adjust undervoltage-lockout threshold using resistor-dividers R1 and R2
2-3	Normal operation; UVLO threshold is 1.285V

Connector J10 mates with the Maxim CMOD232 module, which enables communication with evaluation software running on a PC. As a convenience, the CMOD232 module provides 5V DC power to the VLOGIC net through pin 1 of J10 and JMP7. This voltage can be used to power U1 by placing a shorting link in position 2–3 of JMP6.

User-provided power supplies at J1–J4 are controlled as the IN1–IN4 voltages, and are sequenced or tracked as OUT1–OUT4 at J5–J8. These jacks accept a standard 0.175in tip-jack (banana plug) connector. Ground connections can be established at J9, J11, and at test points TP21 and TP23.

The MAX6876 EV kit is designed with 0.050in traces of 1oz copper for the main power paths. Each IN_/OUT_ pair safely handles up to 5A. Proceed with caution if higher current operation is required.

Light-emitting diodes CR1–CR4 indicate the status of the PG_ signals. A green LED indicates that power is good. The PG_ signals can be monitored at test points TP17–TP20. Likewise, CR5 indicates the status of the REM signal.

Jumper Function Tables

Tables 1 through 5 describe the EV kit configuration jumper functions. For a detailed understanding of the jumpers, see Figure 3, the MAX6876 EV kit schematic.

Table 2. Jumper JMP2, ENABLE

JMP2 SHUNT POSITION	FUNCTION
1-2	Voltage tracking/sequencing enabled
2-3	Voltage tracking/sequencing disabled
Open	Evaluation software control of ENABLE through CMOD232 module

Table 3. Jumper JMP3, $\overline{\text{MARGIN}}$

JMP3 SHUNT POSITION	FUNCTION
1-2	$\overline{\text{MARGIN}}$ function enabled
Open	Normal operation; $\overline{\text{MARGIN}}$ function disabled, or under evaluation software control through CMOD232 module

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Table 4. Jumpers JMP4 and JMP5, I²C Slave Address Selection

JMP4 SHUNT POSITION	JMP5 SHUNT POSITION	A1	A0	MAX6876 I²C ADDRESS	
		(BIT 3)	(BIT 2)	BINARY	HEXADECIMAL
1-2	1-2	0	0	101000xx	A0h
1-2	Open	0	1	101001xx	A4h
Open	1-2	1	0	101010xx	A8h
Open	Open	1	1	101011xx	ACh

Table 5. Jumper JMP6

JMP6 SHUNT POSITION	FUNCTION	CAUTIONARY NOTES
1-2	V_{LOGIC} supplied from ABP pin of MAX6876	Resistors R7–R10 must be removed to prevent loading ABP pin of MAX6876
2-3	V_{LOGIC} connected to V_{CC} net (J12)	――
Open	V_{LOGIC} supplied from pin 1 of J10 or TP22	――

Table 6. Jumper JMP7, CMOD232 Power Connection

JMP7 SHUNT POSITION	FUNCTION	CAUTIONARY NOTES
1-2	V_{LOGIC} receives power from CMOD232 module through pin 1 of J10	If shunt at JMP7 is installed, do not connect external voltage to TP22
Open	No connection between CMOD232 module and V_{LOGIC}	――

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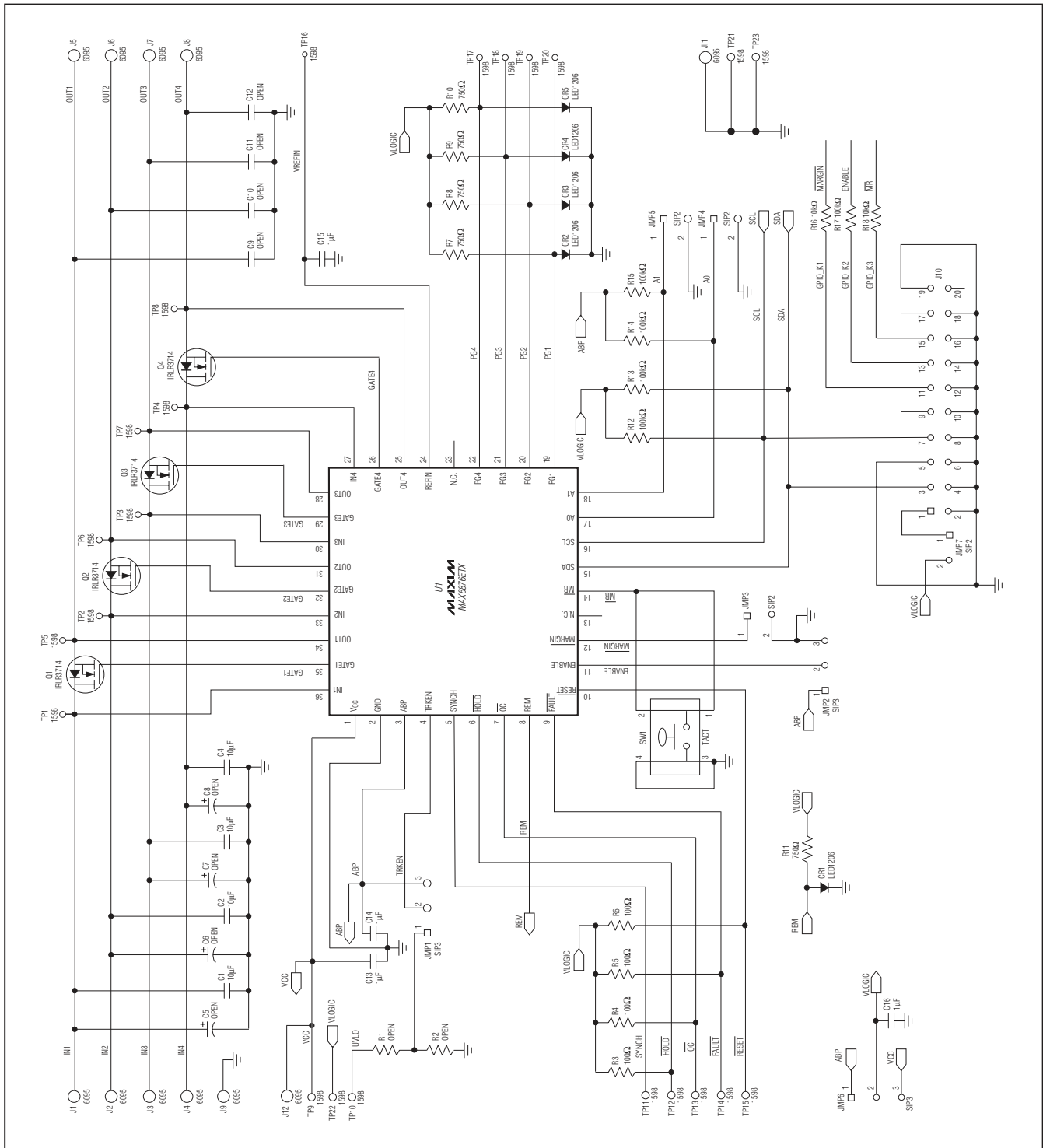
Evaluate: MAX6876

Figure 3. MAX6876 EV Kit Schematic
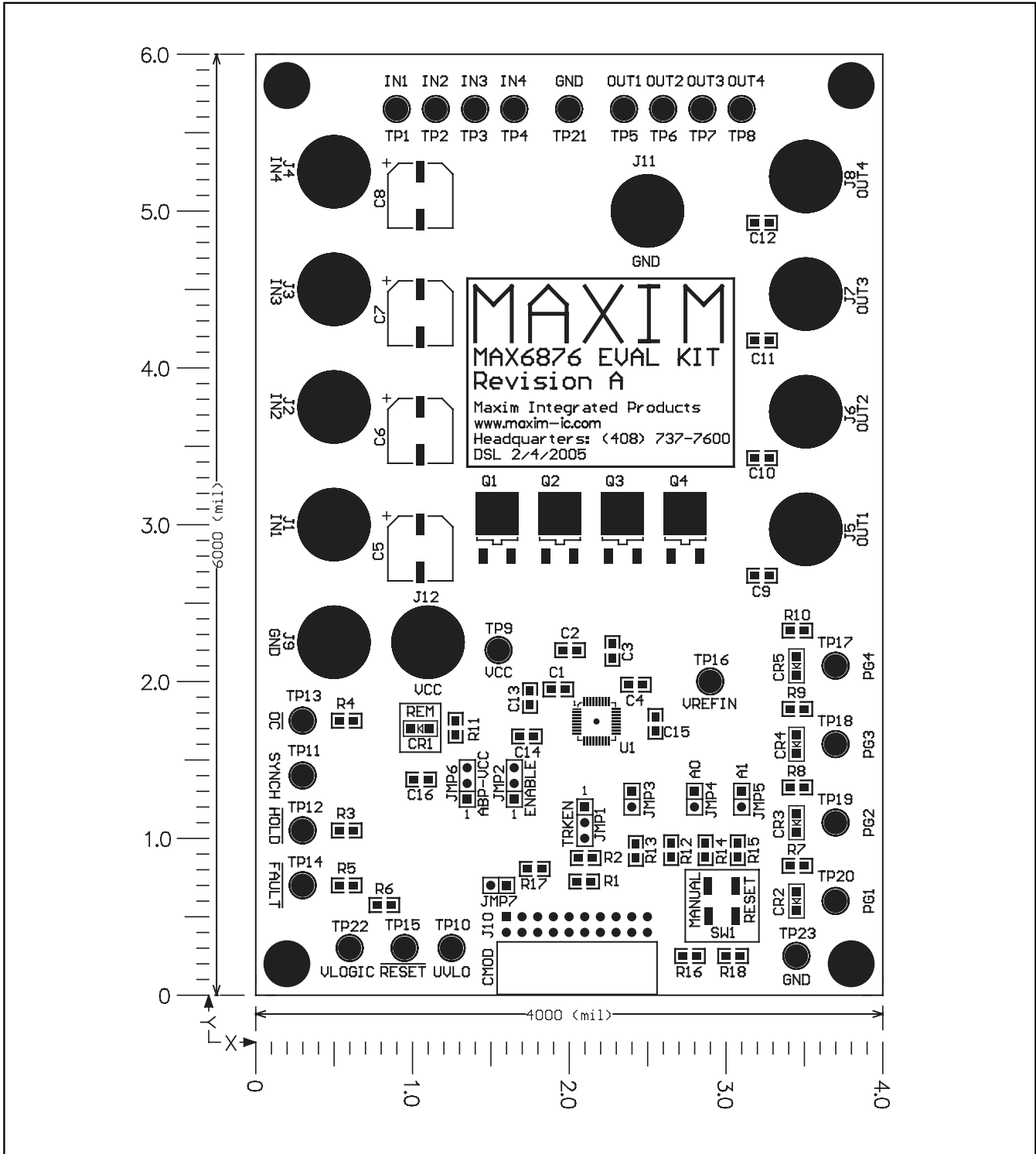
Evaluates: MAX6876

Figure 4. MAX6876 EV Kit Component Placement Guide—Component Side

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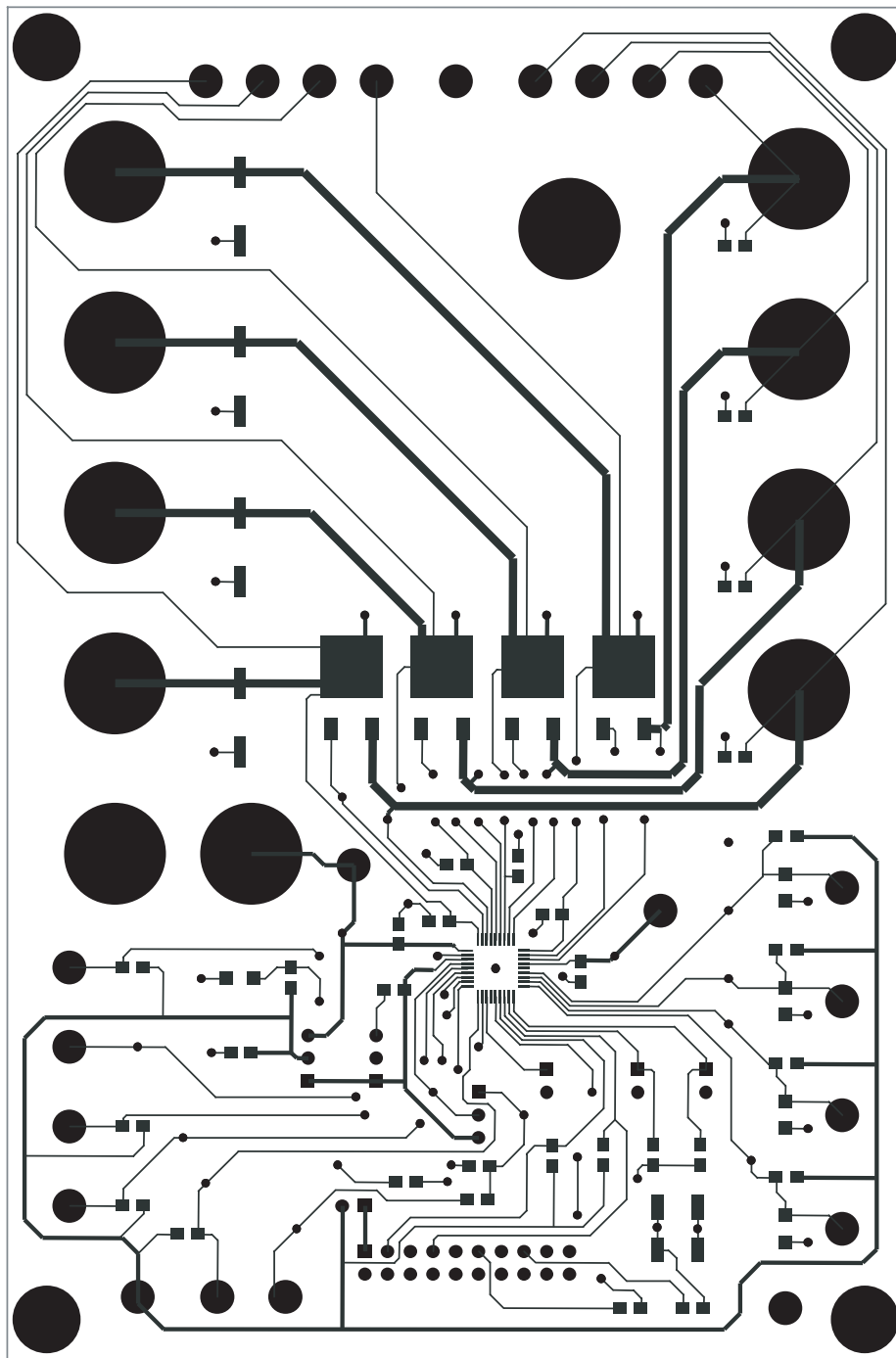
Figure 5. MAX6876 EV Kit PC Board Layout—Top Layer

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MAX6876 Evaluation Kit/Evaluation System
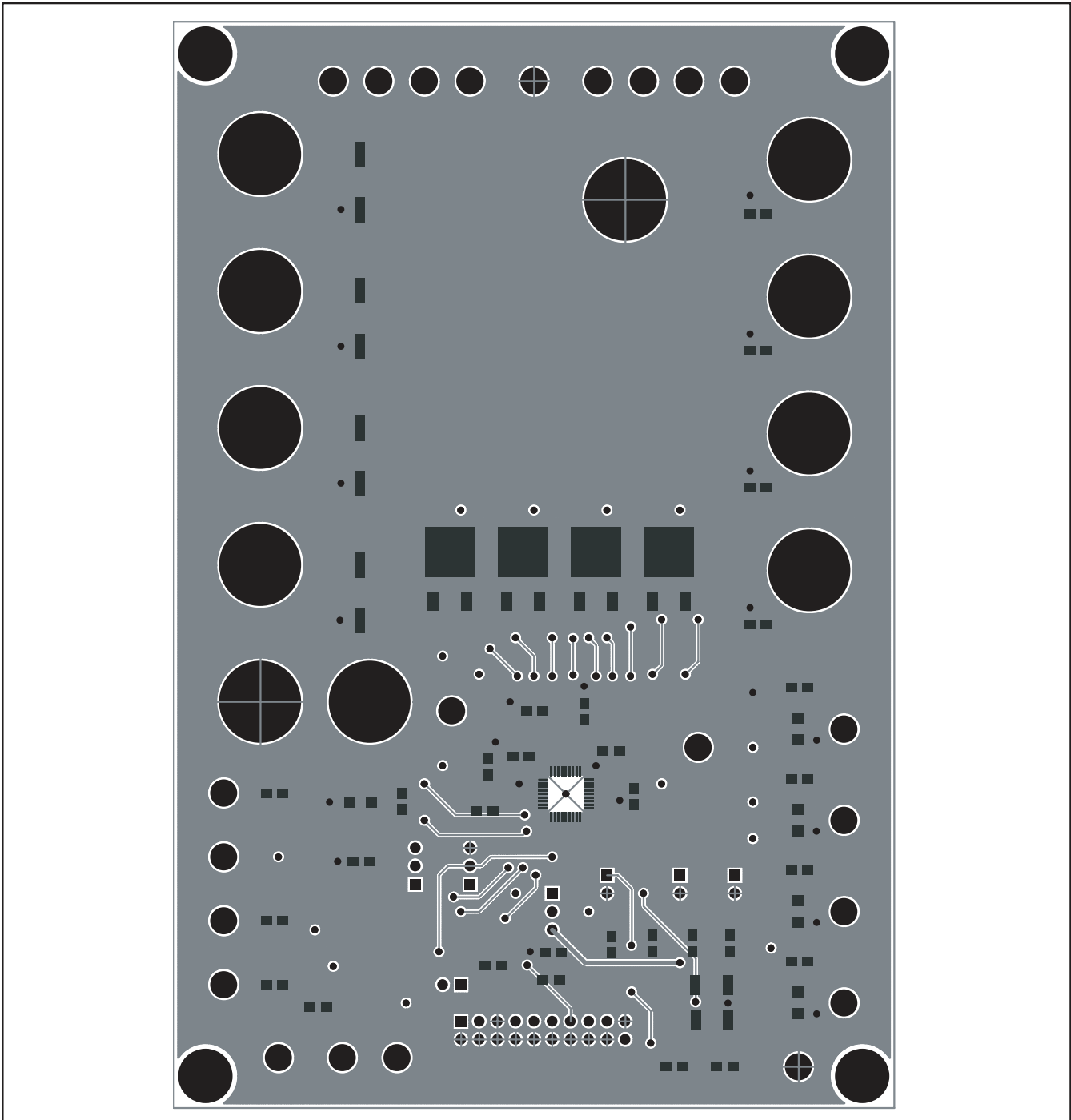
Figure 6. MAX6876 EV Kit PC Board Layout—Bottom Layer