



MAX1338 Evaluation Kit/Evaluation System

General Description

The MAX1338 evaluation system (EV system) is a complete 4-channel, 14-bit data-acquisition system. The MAX1338 EV system (MAX1338EVB16) consists of a MAX1338 evaluation kit (EV kit) and the Maxim 68HC16MOD-16WIDE microcontroller (μ C) module. Order the EV kit (MAX1338EVKIT) separately if the user has a parallel bus controller, or if the 68HC16MOD-16WIDE μ C module has already been purchased.

The MAX1338EVKIT can be used to evaluate the MAX1338 with an external system clock. In this mode, the 68HC16MOD-16WIDE board cannot be used and the user must supply a parallel interface.

MAX1338EVB16 Component List

PART	QTY	DESCRIPTION
MAX1338EVKIT	1	MAX1338 EV kit
68HC16MOD-16WIDE	1	68HC16 μ C module

Features

- ◆ Proven PC Board Layout
- ◆ Windows® 98-/2000-/XP-Compatible Evaluation Software
- ◆ Unpopulated PC Board Landing Pads for Buffers on All Input Channels
- ◆ Headers to Connect EV Kit to Logic Analyzer
- ◆ Fully Assembled and Tested

Ordering Information

PART	INTERFACE TYPE
MAX1338EVKIT	User-Supplied Parallel-Bus Controller
MAX1338EVB16	Windows Software

Note: The MAX1338 software is included with the MAX1338 EV kit but is designed for use with the complete EV system. The EV system includes both the Maxim μ C module and the EV kit. If the Windows software will not be used, the EV kit board can be purchased without the Maxim μ C module.

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MAX1338EVKIT Component List

DESIGNATION	QTY	DESCRIPTION
C1-C4, C38	5	2.2 μ F \pm 10%, 25V X7R ceramic capacitors (1206) TDK C3216X7R1E225K
C5-C25	21	0.1 μ F \pm 10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K
C26	1	1000pF \pm 10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H102K
C27, C28	2	1.0 μ F \pm 10%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A105K
C29	1	4.7 μ F \pm 10%, 16V X7R ceramic capacitor (1206) TDK C3216X7R1C475K
C30-C37	8	470pF \pm 10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H471K
ECLK, CONVST	2	SMA connectors
FB1	1	Ferrite bead TDK MMZ1608B601C (0603)
J1	1	2 x 9-pin header
J2	1	2 x 14-pin header

DESIGNATION	QTY	DESCRIPTION
J3, J4	2	2 x 20, 0.1in, right-angle receptacles
JU1, JU2, JU3	3	2-pin headers
JU4-JU11	0	Not installed (2-pin headers)
JU12, JU13, JU14	3	3-pin headers
R1-R8	8	100k Ω \pm 5% resistors (0603)
R9-R16	8	10 Ω \pm 5% resistors (0603)
R17-R24	0	Not installed (0603)
R25-R32	0	Not installed (0603)
U1	1	4-channel/14-bit ADC MAX1338ETN (56 TQFN-EP 8mm x 8mm)
U2-U5	0	Not installed (8-pin SO buffers)
U6	1	Ultra-high-precision voltage regulator MAX6126AASA25 (8-pin SO)
None	1	MAX1338 EV kit PC board
None	6	Shunts
None	1	MAX1338 EV kit software, CD-ROM

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Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata	770-436-1300	www.murata.com
TDK	847-803-6100	www.component.tdk.com

Note: Indicate you are using the MAX1338 when contacting these component suppliers.

MAX1338EV Kit Files

INSTALL.EXE	Installs the EV kit files on your computer
MAX1338.EXE	Application program
MAX1338.C16	68HC16MOD-16WIDE firmware
HELPPFILE.HTM	MAX1338 EV kit help file
UNINST.INI	Uninstalls the EV kit software
MAX1338.ASM	68HC16MOD-16WIDE firmware source file
EVKIT2.ASM	68HC16MOD-16WIDE firmware source file
GPT.ASM	68HC16MOD-16WIDE firmware source file
QSPI.ASM	68HC16MOD-16WIDE firmware source file

Quick Start

Recommended Equipment

- MAX1338EVKIT
- 68HC16MOD-16WIDE μ C module
- Two power supplies:
 - 1) 8V or higher (up to 20V) at 300mA for the 68HC16MOD-16WIDE
 - 2) 5V \pm 5% at 250mA for AVDD
- DVM (digital voltmeter)
- User-supplied 9-pin I/O extension cable
- User-supplied Windows 98/2000/XP PC
- RS-232 serial port on the PC
- Waveform generator (optional)
- Logic analyzer (optional)

Procedure

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

- 1) Set JU1 to 1-2 (selects on-board external reference).
- 2) Set JU2 to 1-2 (enables the MAX1338's internal clock).
- 3) Remove shunt from JU3 (disables autoread feature).
- 4) Set JU12 to 1-2 (selects the MAX1338's internal clock).
- 5) Set JU13 to 2-3 (selects VCC from the 68HC16MOD-16WIDE as DVDD).
- 6) Set JU14 to 2-3 (selects VCC from the 68HC16MOD-16WIDE as DRVDD).
- 7) Connect the MAX1338 EV kit's two 40-pin female connectors (J3 and J4) to the 68HC16MOD-16WIDE module's two 40-pin male connectors (P1 and P2).
- 8) Connect the 9-pin serial cable from the computer's serial port to the 68HC16MOD-16WIDE module's DB9 connector (J3).
- 9) Install the MAX1338 evaluation software on your computer by running the INSTALL.EXE program. The files can be obtained from the Maxim website or the included CD. The program files are copied and icons are created for them in the Windows start menu.
- 10) Connect the 8V (up to 20V supported) power supply to the 68HC16MOD-16WIDE's power connector (J2).
- 11) Connect the 5V power supply between the MAX1338 EV kit's AVDD and AGND pads.
- 12) Turn on the 8V power supply.
- 13) Turn on the 5V power supply.
- 14) Turn on the 68HC16MOD-16WIDE by setting SW1 to the **ON** position.
- 15) Measure the voltage at the REF pad on the MAX1338 EV kit using the DVM, and verify that the voltage is 2.500V \pm 0.025V.
- 16) Start the MAX1338 EV kit software by double-clicking its icon in the start menu.

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Detailed Description of Software

To start the software, double-click the MAX1338 EV kit icon that is created during installation. The serial form, shown in Figure 1, appears and the user must click **OK** to upload the firmware to the 68HC16MOD-16WIDE.

When the firmware has been uploaded and the μC on the 68HC16MOD-16WIDE has booted, the MAX1338 evaluation software shown in Figure 2 appears.

The **Input Values** box displays the raw data and corresponding input voltage of all four channels after sampling (except in block-sample mode).

The **Select Input Range** box contains a pulldown menu for each input channel of the IC. These pulldown menus allow the user to select the input range ($\pm 10\text{V}$, $\pm 5\text{V}$, $\pm 2.5\text{V}$, or $\pm 1.25\text{V}$) for each channel.

The checkboxes in the **Power-Saving Modes** box allow the user to enable the different power-saving features of the MAX1338. The two checkboxes are labeled **SHDN** and **STANDBY**, and represent the state of the MAX1338's pin with the same designation. Checking

and unchecking these boxes sets the corresponding IC pin high and low, respectively.

The **Reference Voltage** box allows the user to specify the exact reference voltage being used. This voltage value is used in the transfer function for converting the raw data into a corresponding sampled input voltage.

The **Sample Options** box is used to control sampling of the MAX1338. The **Sampling Mode** pulldown menu allows the user to choose between single-sample mode, continuous-sample mode, and block-sample mode.

In single-sample mode, the **Sample** button is used to sample the four input channels once. In continuous-sample mode, the **Start** and **Stop** buttons are used to begin and end the continuous sampling of all four channels. The sampling interval (between 200ms and 10,000ms) can be entered in the sampling interval text field. In block-sample mode, the **Sample** button is used to bring up the sampling tool (see Figure 3), and the **FS** (sampling frequency) scroll bar is used to select a sampling frequency (per channel). Note that the sampling frequency is typically accurate to within 0.5ms. To

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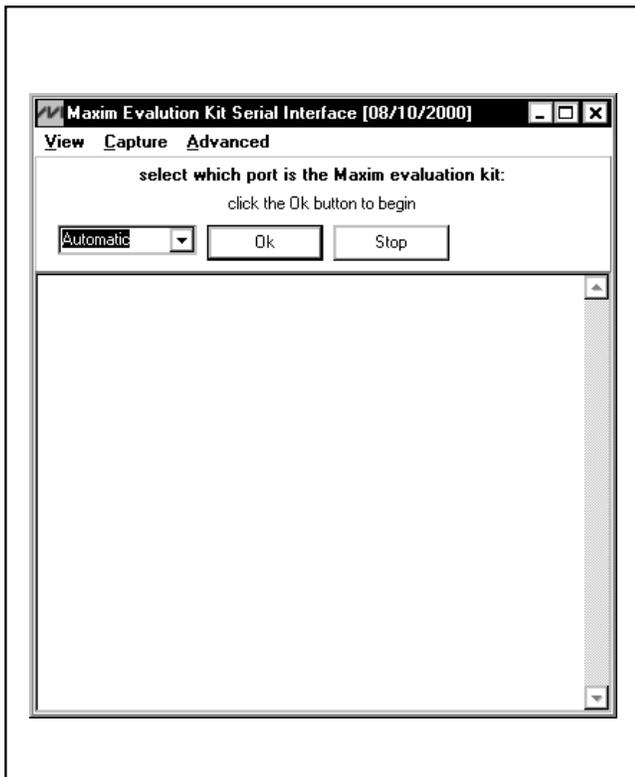


Figure 1. Serial Form

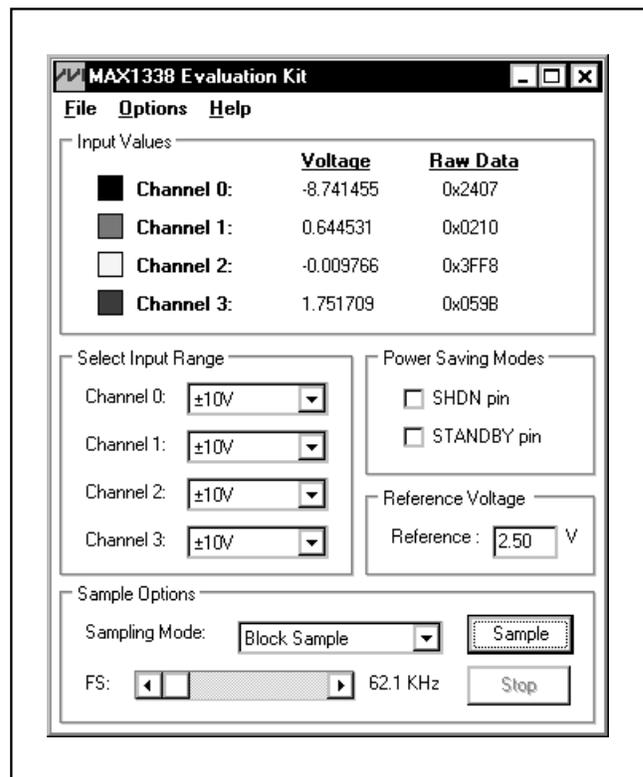


Figure 2. MAX1338 Evaluation Software

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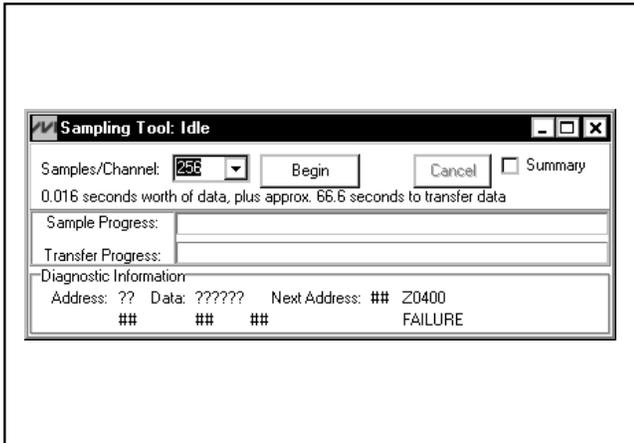


Figure 3. Sampling Tool

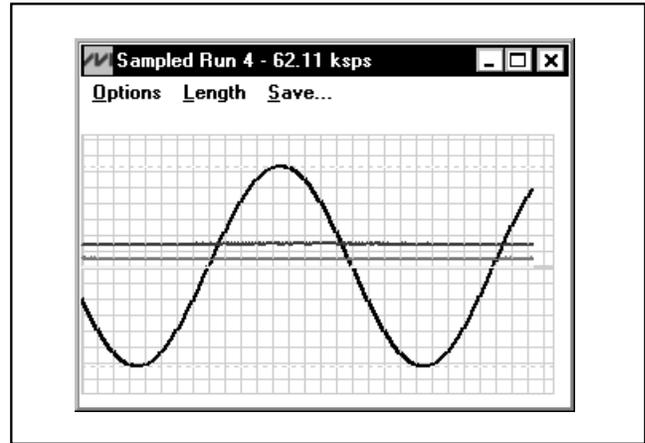


Figure 4. Graph Form

determine the exact sampling frequency per channel in block-sample mode, observe consecutive falling edges on the CONVST pin (J1-7) when sampling. To capture data for precision FFTs, use the MAX1338 EV kit with an external clock and a logic analyzer (instead of the 68HC16MOD-16WIDE) to read the parallel bus. This improves the accuracy of the ADC clocking system.

When using the MAX1338 evaluation software, it can be useful to display the serial form (see Figure 1) and/or the graph form (see Figure 4). To display these forms, click on the appropriate command in the **Options** menu. The serial form displays all communication between the MAX1338 evaluation software and the 68HC16MOD-16WIDE. The graph form displays a graph of sampled results when the software is in continuous-sample mode.

Note that when viewing graphical information (using either the graph form in continuous-sample mode or done automatically in block-sample mode), the raw codes collected from the MAX1338 are converted from two's complement to signed decimal. The raw data can be saved to a text file using the **Save...** menu item in the graph window.

Detailed Description of Hardware

MAX1338EVB16 EV System

The MAX1338 EV system (MAX1338EVB16) is a complete, 4-channel, 14-bit, data-acquisition system consisting of a MAX1338 EV kit and the Maxim 68HC16MOD-16WIDE μ C module.

68HC16MOD-16WIDE μ C Module

The 68HC16MOD-16WIDE provides a 16-bit parallel bus to demonstrate various Maxim devices. Maxim reserves the right to change the implementation of this module at any time with no advance notice.

MAX1338 EV Kit

The MAX1338 EV kit board provides a proven layout for evaluating the MAX1338 4-channel, 14-bit ADC and can be obtained separately without the 68HC16MOD-16WIDE μ C module. The MAX1338 EV kit includes an on-board 2.5V reference (MAX6126) and unpopulated PC board landing pads for buffers on all four input channels. The MAX1338ETN (U1) is powered from three sources. The user must supply +5V between AVDD and AGND, +5V between DVDD and DGND, and +3V to +5V between DRVDD and DRGND. DVDD and DRVDD can also be supplied from the 68HC16MOD-16WIDE's 5V regulator using JU13 and JU14, respectively.

The MAX1338 on the EV kit uses the on-board MAX6126 2.5V reference instead of its internal reference when shipped. To use the MAX1338's internal 2.5V reference, remove the shunt from JU1. To use a user-supplied external reference, first remove the shunt from JU1, and then apply the external reference to the REF pad. When using a nondefault reference value, update the value in the EV kit software's **Reference Voltage** box.

A logic analyzer can be used instead of the 68HC16MOD-16WIDE to evaluate the MAX1338 EV kit. To use a logic analyzer, disconnect the EV kit from the

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68HC16MOD-16WIDE and connect the logic analyzer to J1 and J2. These headers allow access to the MAX1338's control pins (J1) and data pins (J2). See the schematic in Figure 6 for pin designations.

When shipped, the MAX1338 EV kit is configured to use the MAX1338's internal clock. To use an external clock, connect the clock signal to the ECLK SMA connector, remove the shunt from JU2, and set the shunt on JU12 to the 2-3 position. In this configuration, the 68HC16MOD-16WIDE can no longer be used, and the user must supply a parallel interface (i.e., logic analyzer).

Note that when the 68HC16MOD-16WIDE is not being used as the parallel interface, JU13 and JU14 must be set to the 1-2 position. The +5V digital supply voltage must then be applied between the DVDD and DGND pads, and the +3V to +5V digital I/O supply voltage must be applied between the DRVDD and DRGND pads.

Also, when the 68HC16MOD-16WIDE is not being used as the parallel interface, the MAX1338 EV kit can be configured in autoread mode by placing a jumper on pins 1-2 of JU3. In this mode, the MAX1338's \overline{EOC} pin is connected to the \overline{RD} strobe, and the output data is available immediately on the parallel bus at the falling edge of \overline{EOC} . When performing autoread, connect the \overline{CS} pin low by placing a shunt across J1-9 and J1-10.

Using Input Buffers

The unpopulated buffer landing pads (U2–U5) and corresponding discrete components can be populated to buffer the input signals. When using input buffers, the positive supply must be applied on the HVAVCC pad, and the negative supply must be applied on the HVAVEE pad. Connect the ground for these supplies to the AGND pad. Note that if the input buffers are unable to drive the capacitive load of the anti-aliasing filters on the MAX1338 inputs (R9–R16 and C30–C37), the filter may need to be adjusted or removed. To remove the filter, replace R9–R16 with a wire or 0Ω resistor, and remove C30–C37.

Jumper Selection Tables

The following tables (Tables 1–7) explain the functionality of each jumper on the MAX1338 EV kit.

Table 1. Reference Select

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	Short*	Select on-board 2.5V reference (MAX6126) as voltage reference.
	Open	Select internal 2.5V reference or user-supplied external voltage on REF pad as voltage reference. Note that the user-supplied external voltage must be between 2V and 3V.

*Default configuration

Table 2. ADC Clock Source Select

JUMPER	SHUNT POSITION	DESCRIPTION
JU2	Short*	Select internal clock as ADC system clock.
	Open	Select external ECLK SMA as ADC system clock.

*Default configuration

Table 3. Autoread Mode

JUMPER	SHUNT POSITION	DESCRIPTION
JU3	Short	Connects \overline{RD} and \overline{EOC} lines for autoread mode.
	Open*	Disables autoread mode.

*Default configuration

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Table 4. Buffered Input Select (Not Installed)

JUMPER	SHUNT POSITION	DESCRIPTION
JU4–JU11	Short	Select buffered input for AIN ₊ or AIN ₋ .
	Open*	Select unbuffered input for AIN ₊ or AIN ₋ .

*Default configuration

Table 5. ADC System Clock Select

JUMPER	SHUNT POSITION	DESCRIPTION
JU12	1-2*	Select internal clock as ADC system clock.
	2-3	Select external ECLK SMA as ADC system clock.

*Default configuration

Table 6. DVDD Select

JUMPER	SHUNT POSITION	DESCRIPTION
JU13	1-2	DVDD supplied from DVDD pad.
	2-3*	DVDD connected to VCC supply from 68HC16MOD-16WIDE.

*Default configuration

Table 7. DRVDD Select

JUMPER	SHUNT POSITION	DESCRIPTION
JU14	1-2	DRVDD supplied from DRVDD pad.
	2-3*	DRVDD connected to VCC supply from 68HC16MOD-16WIDE.

*Default configuration

General Troubleshooting

Problem 1: 68HC16MOD-16WIDE not found (see Figure 5).

- Is LED1 on the 68HC16MOD-16WIDE lit?
- Is the power supply connected?
- Is SW1 turned to **ON** position?

- Is the DB9 serial-communications cable connected?
- Could another application be using the COM port (i.e., PDA software)?

Problem 2: Cannot read data from MAX1338 EV kit.

- Are the MAX1338 EV kit power supplies (AVDD, DVDD, and DRVDD) connected?
- Are JU2 and JU12 set for internal or external clock?
- Are JU4–JU11 set for buffered or unbuffered inputs?
- Are the buffer power supplies (HVAVCC and HVACEE) connected?
- Is the part in shutdown mode or standby mode?

Problem 3: Data being read from the MAX1338 seems incorrect.

- Is the reference voltage entered correctly in the MAX1338 evaluation software?
- Is the source impedance less than 100Ω?

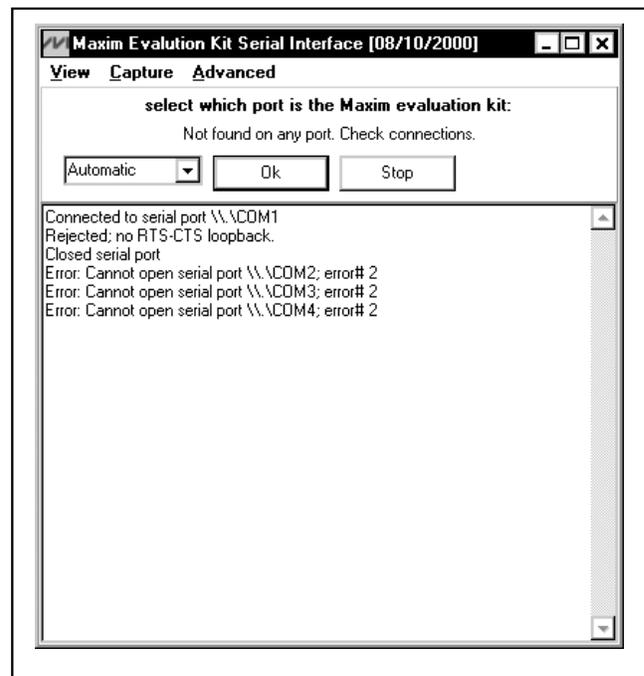


Figure 5. 68HC16MOD-16WIDE Not-Found Error Message

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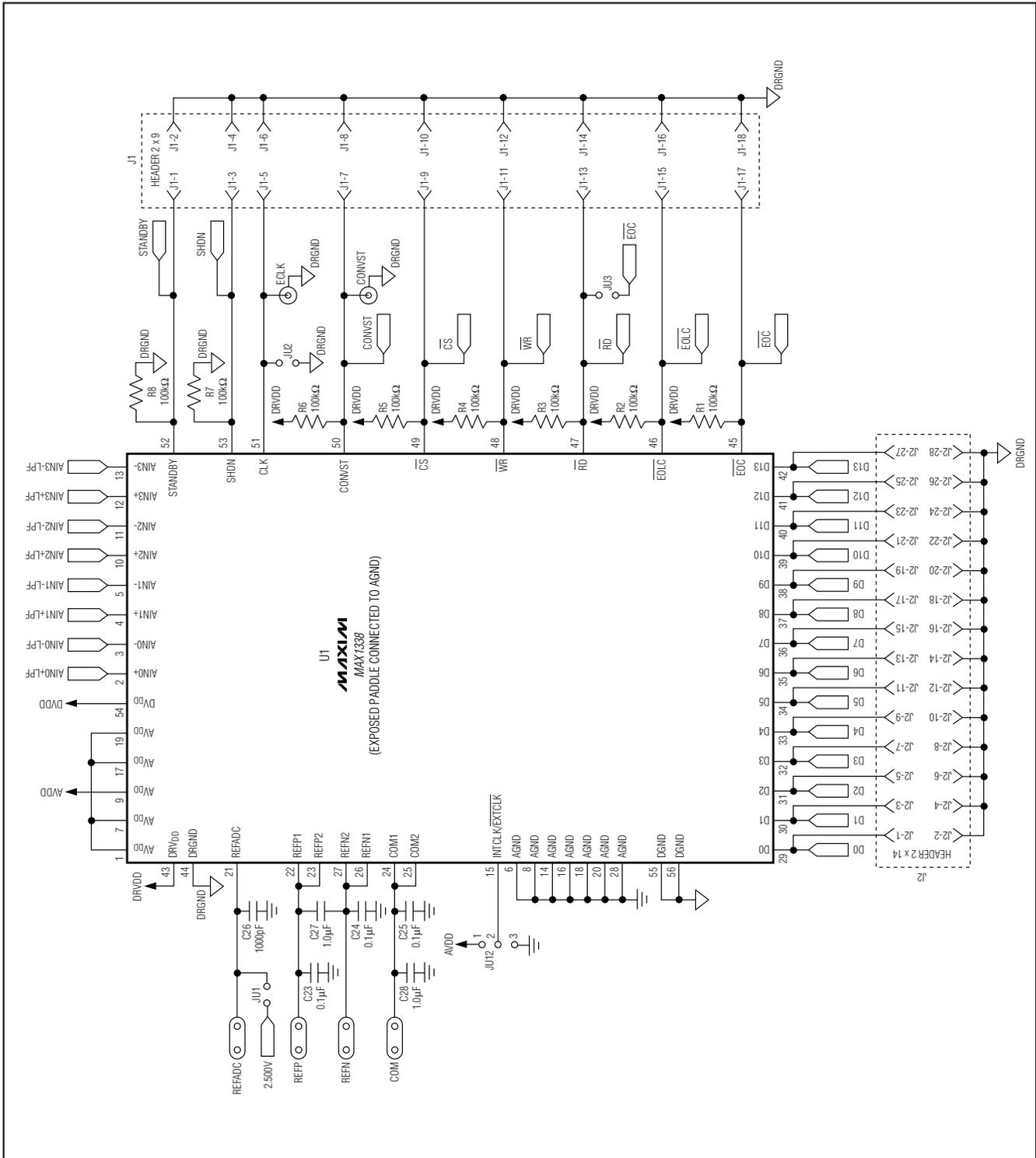


Figure 6. MAX1338 EV Kit Schematic (Sheet 1 of 3)

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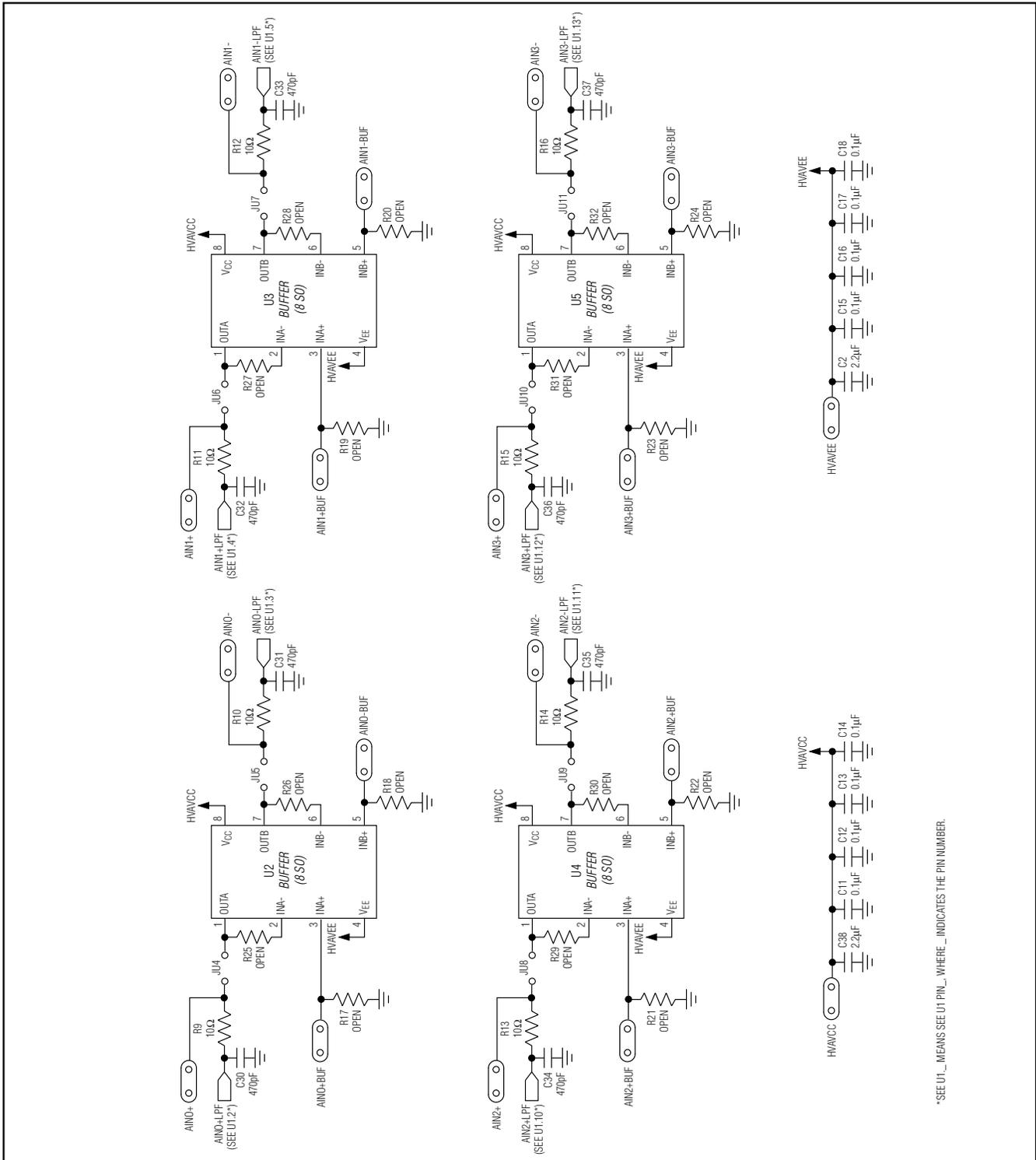
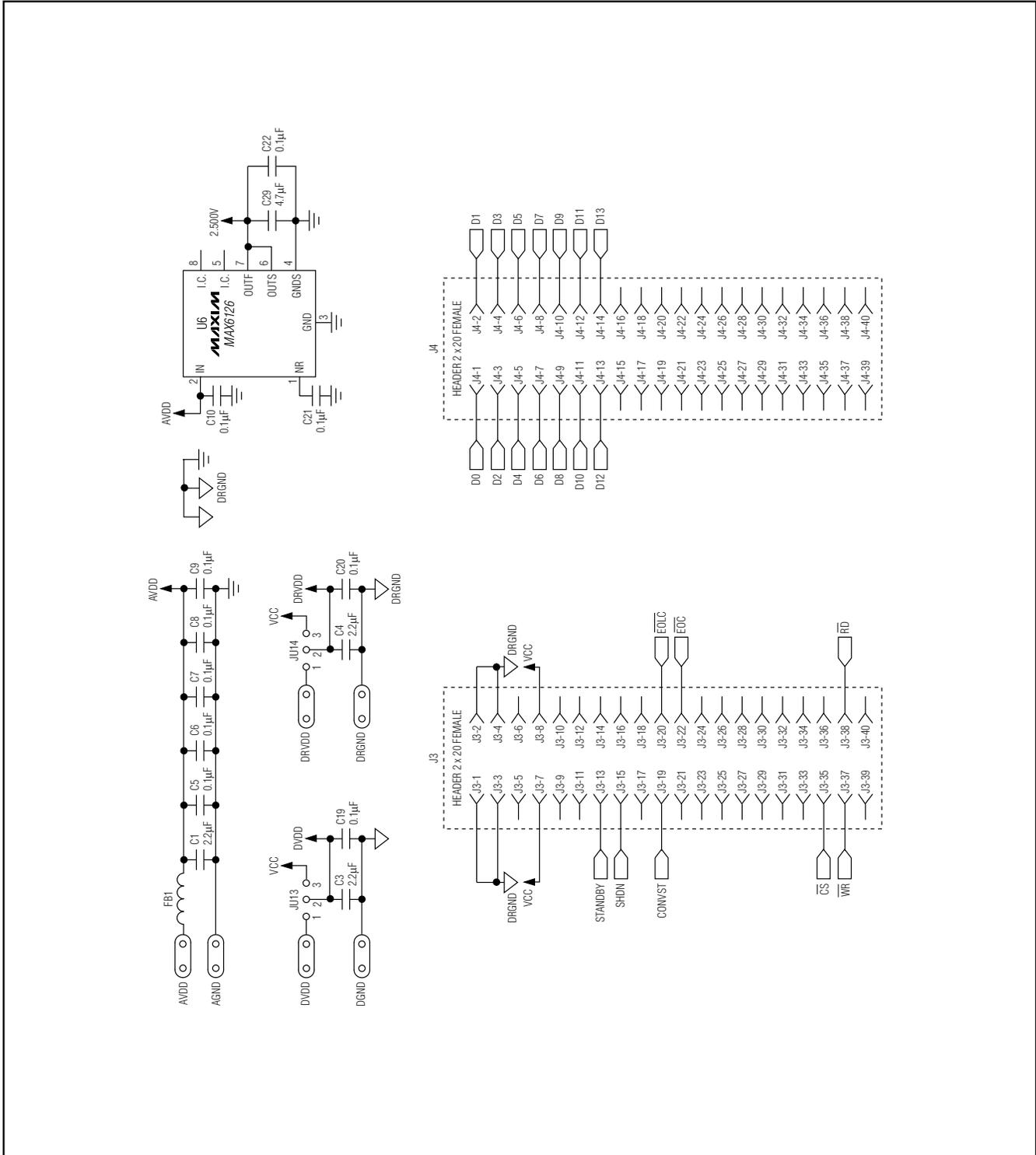


Figure 6. MAX1338 EV Kit Schematic (Sheet 2 of 3)

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Figure 6. MAX1338 EV Kit Schematic (Sheet 3 of 3)

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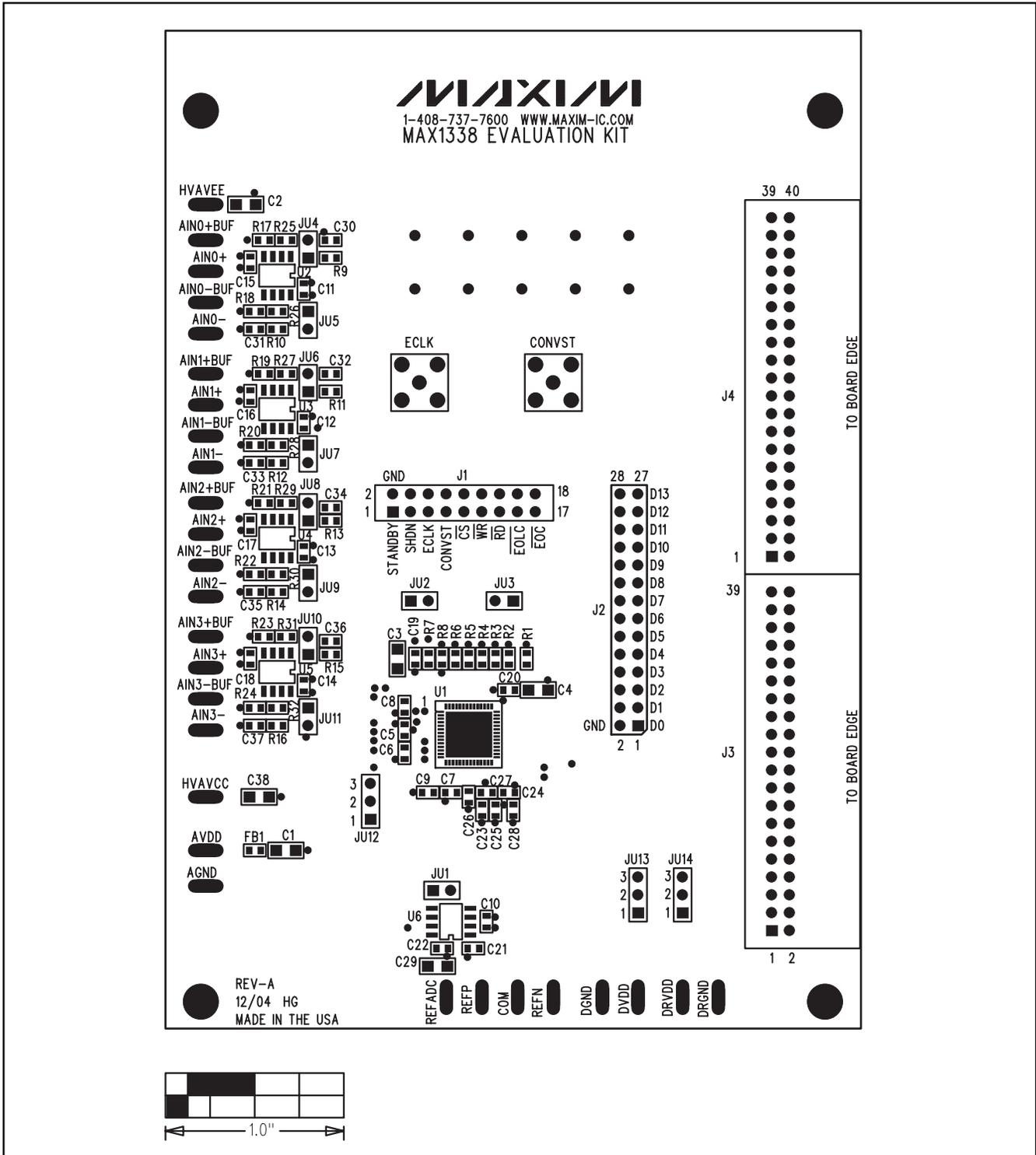


Figure 7. MAX1338 EV Kit Component Placement Guide—Component Side

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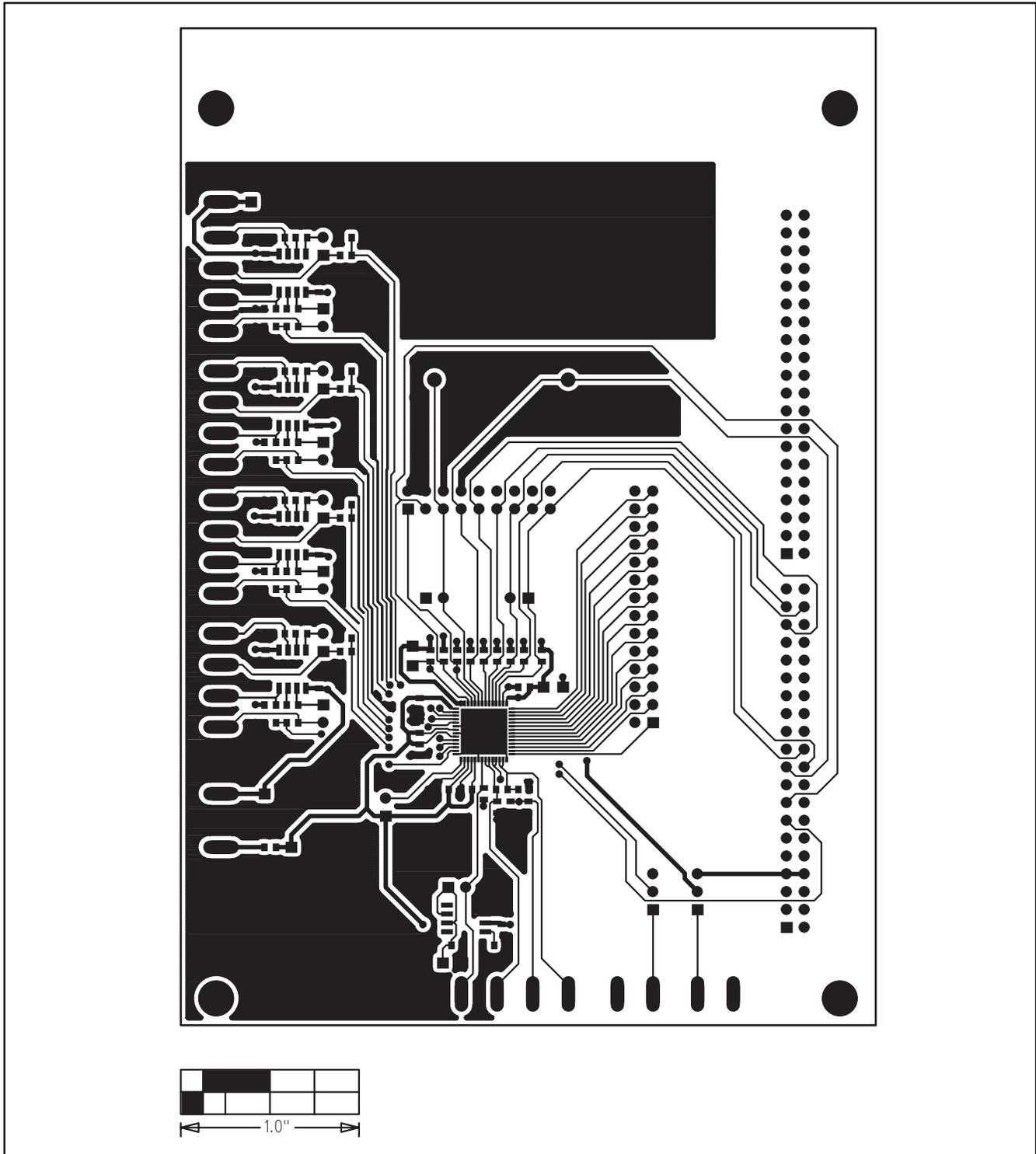


Figure 8. MAX1338 EV Kit PC Board Layout—Component Side

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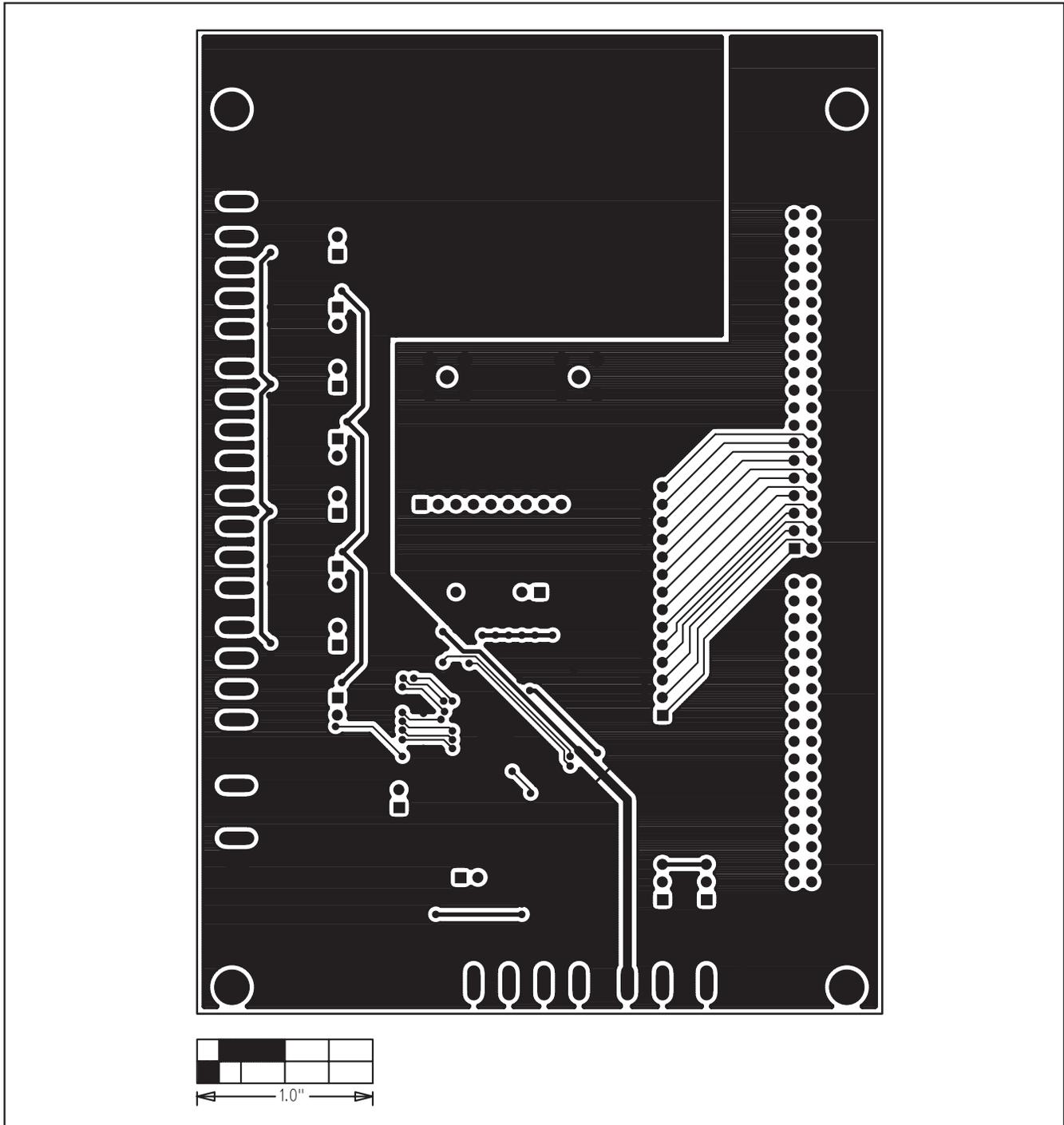


Figure 9. MAX1338 EV Kit PC Board Layout—Solder Side

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