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General Description

The MAX5216DACLite evaluation kit (EV kit) enables evaluation of the MAX5216 single-channel, low-power, buffered-output, 3-wire SPI interface, 16-bit DAC. The EV kit also includes Windows XP®-, Windows Vista®-, and Windows® 7-compatible software that provide a simple graphical user interface (GUI) for exercising the features of the IC.

The EV kit enables a quick evaluation of the device, with a fixed supply voltage of 3.3V. The EV kit allows for the generation of selectable waveforms to display DAC AC signal-generation capability.

The EV kit can be used as a system hardware debugging tool, or as a signal generator demonstration kit.

Features

- USB Powered, No Additional Supply Needed* (Cable Not Included)
- 3.3V Fixed VDD from On-Board LDO (MAX8510)
- 3.000V On-Board Precise Voltage Reference (MAX6133)
- Direct USB Communication through the MAXQ622 Microcontroller
- Windows XP-, Windows Vista-, and Windows 7 (32-Bit)-Compatible Software
- SPI Interface Terminals
- Proven PCB Layout
- Fully Assembled and Tested

*Since 16 bits is 65,535 levels, the LSB is 45.8µV. Depending on how clean the computer's USB power is, it may be necessary to provide clean analog power for the best accuracy.

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C5–C7, C9	6	1µF ±10%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A105K
C3	1	0.01µF ±10%, 50V X7R ceramic capacitor (0603) TDK CGA3E2X7R1H103K
C4, C8, C12–C14	4	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104KA01J
C10, C11	2	18pF ±5%, 50V C0G ceramic capacitors (0603) TDK C1608C0GH1180JT
FB1	1	Ferrite bead (0805) TDK MMZ20112Y601BT

DESIGNATION	QTY	DESCRIPTION
J1	1	Mini-USB type-B receptacle Mill-Max 897-43-005-00-100001
J2	0	Not installed, 10-pin (5 x 2) header, 0.1in
J3	0	Not installed, 1-pin header, 0.1in
J4	0	Not installed, 1-pin header
J5, J7, J8	4	Turret terminal pins Mill-Max 2108-2-00-44-00-00-07-0
J6	0	Not installed, 4-pin header
J9	0	Not installed, RF-coax SMA connector Molex 733910060

Windows XP, Windows Vista, and Windows are registered trademarks and registered service marks of Microsoft Corporation.

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R1, R2, R10	3	27Ω ±1% resistors (0603) YAGEO RC0603FR-0727RL
R3	1	1kΩ ±1% resistor (0603) Panasonic ERJ-3EKF1001V
R4–R9	6	0Ω ±1% resistors (0603) YAGEO RC0603FR-070RL
U1	1	16-bit V$_{OUT}$ DAC (8 µMAX®) Maxim MAX5216GUA+
U2	1	16-bit microcontroller with USB 2.0 interface (64 LQFP) Maxim MAXQ622G-0000+

DESIGNATION	QTY	DESCRIPTION
U3	1	3.000V, 3ppm/°C, low-power voltage reference (8 µMAX) Maxim MAX6133A30+
U4	1	3.3V ultra-low noise LDO (5 SC70) Maxim MAX8510EXK33+
Y1	1	12MHz crystal oscillator (HC49US) Abracon Crystals ABLS-12.000MH-B4-T
—	1	PCB: MAX5216DACLITE# Rev. A

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Abracon Corporation	945-546-8000	www.abracon.com
Mill-Max Mfg. Corp.	516-922-6000	www.mill-max.com
Molex	800-768-6539	www.molex.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Panasonic Corp.	800-344-2112	www.panasonic.com
TDK Corp.	847-803-6100	www.component.tdk.com
YAGEO Corporation	—	www.yageo.com

Note: Indicate that you are using the MAX5216 when contacting these component suppliers.

Quick Start

Required Equipment

- MAX5216DACLite EV kit
- The EV kit board is a plug-n-play device that connects to the PC through a USB-A to Mini-B cable. The cable is not included, but is widely available from local stores.
- The EV kit is preloaded with the default firmware that communicates with the MAX5216DACLite evaluation software. Software can be installed and run on any Windows-based system.
- Digital multimeter (DMM)

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.

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

Procedure

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

1) Visit **www.maximintegrated.com/evkitsoftware** to download the latest version of the EV kit software, 5216DACLiteRxx-LV.ZIP. Unzip the file and run the setup.exe. Follow the instructions to install the evaluation software on your PC. The program files are copied and icons are created in the Windows **Start | Programs** menu. Connect the MAX5216DACLite to the PC though a USB cable. No additional driver is needed; Windows recognizes the new device as a human interface device (HID) and automatically finds and installs the appropriate driver for it. For more information, check the device properties in: **Device Manager\Human Interface Control\USB Input Device\Properties → USB\VID_0B6A&PID_1234.** See Figure 1.

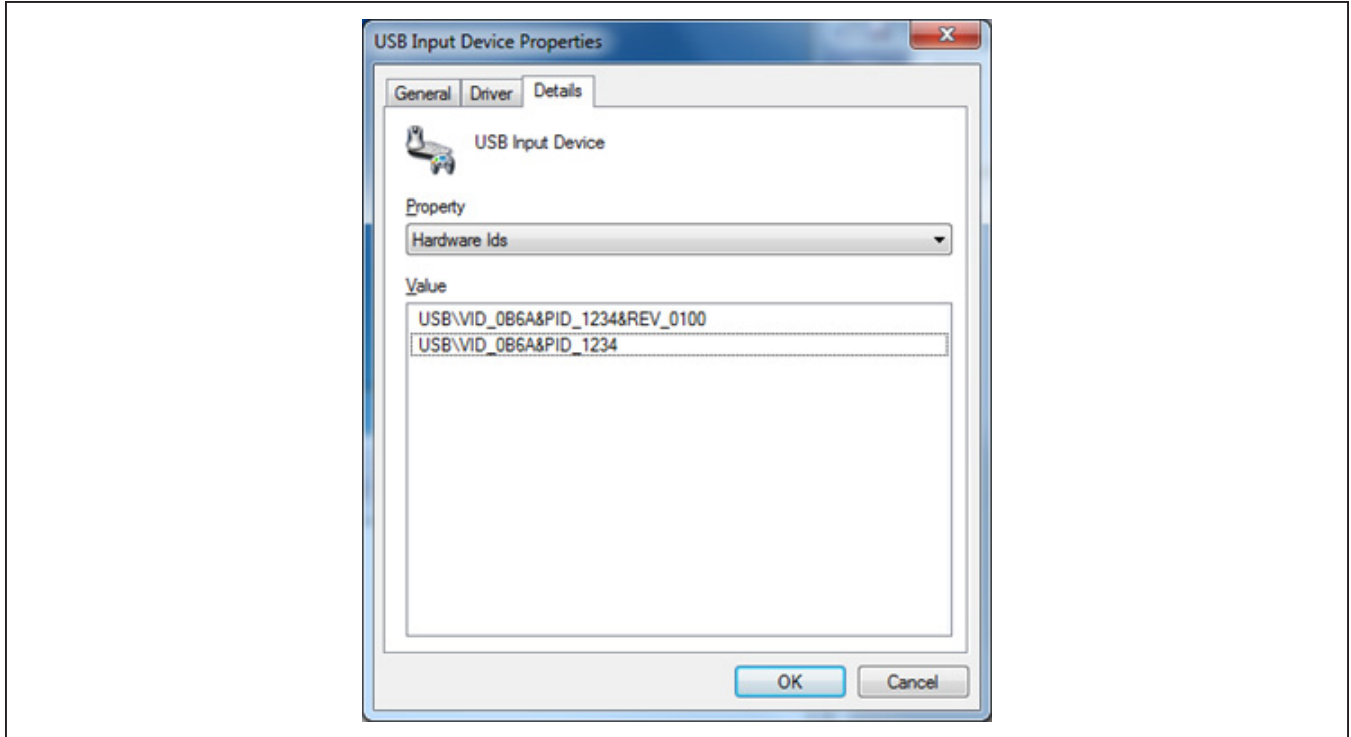2) Run the MAX5216DACLite.exe program. The application's GUI appears, as shown in Figure 2.
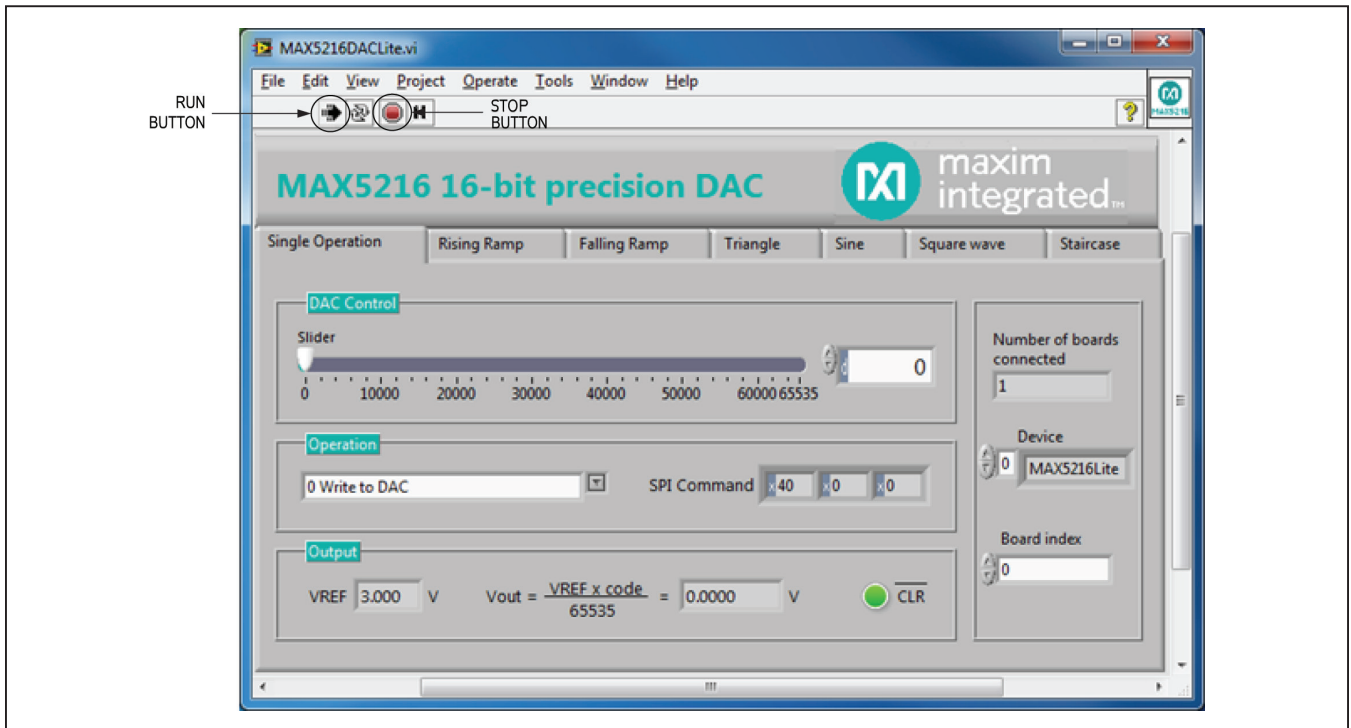
Figure 1. USB Input Device Properties

Figure 2. MAX5216DACLite EV Kit (Single Operation Tab)

Detailed Description of Software

Single Operation Tab

The **Single Operation** tab sheet (Figure 2) is active by default. The application checks all the boards with the USB VID/PID 0x0B6A/0x1234 that connected to the PC and indicates them on the right side of the GUI. Up to 16 boards can be connected to the system. Each board has its own unique board index. Select the appropriate board index in the **Board Index** spin box (Figure 3).

Any possible operation can be evaluated on this tab sheet. For example, move the track bar slider to set the DAC output voltage. The **DAC Control** spin box reflects the slider position with a decimal number. Connect the DMM to the J5 header (Figure 8) to measure the DAC output voltage.

The DAC output can also be set by typing in a decimal, hexadecimal, or an octal or binary value in the **DAC Control** spin box (Figure 4). The IC accepts codes from 0 to 65535 (2^{16}-1) decimal or from 0 to FFFF hex. The notation is displayed on the left side of the box.

The **Rising Ramp**, **Falling Ramp**, **Triangle**, **Sine**, **Square wave**, or **Staircase** tab sheets give the DAC the ability to generate different waveforms with the selected parameters (see the sine-wave and staircase plots in Figures 5 and 6). There is a possible delay to start a new waveform until the previous one finishes a full cycle when switching between tabs. It is recommended to stop running the application, select the next tab, and run it again.
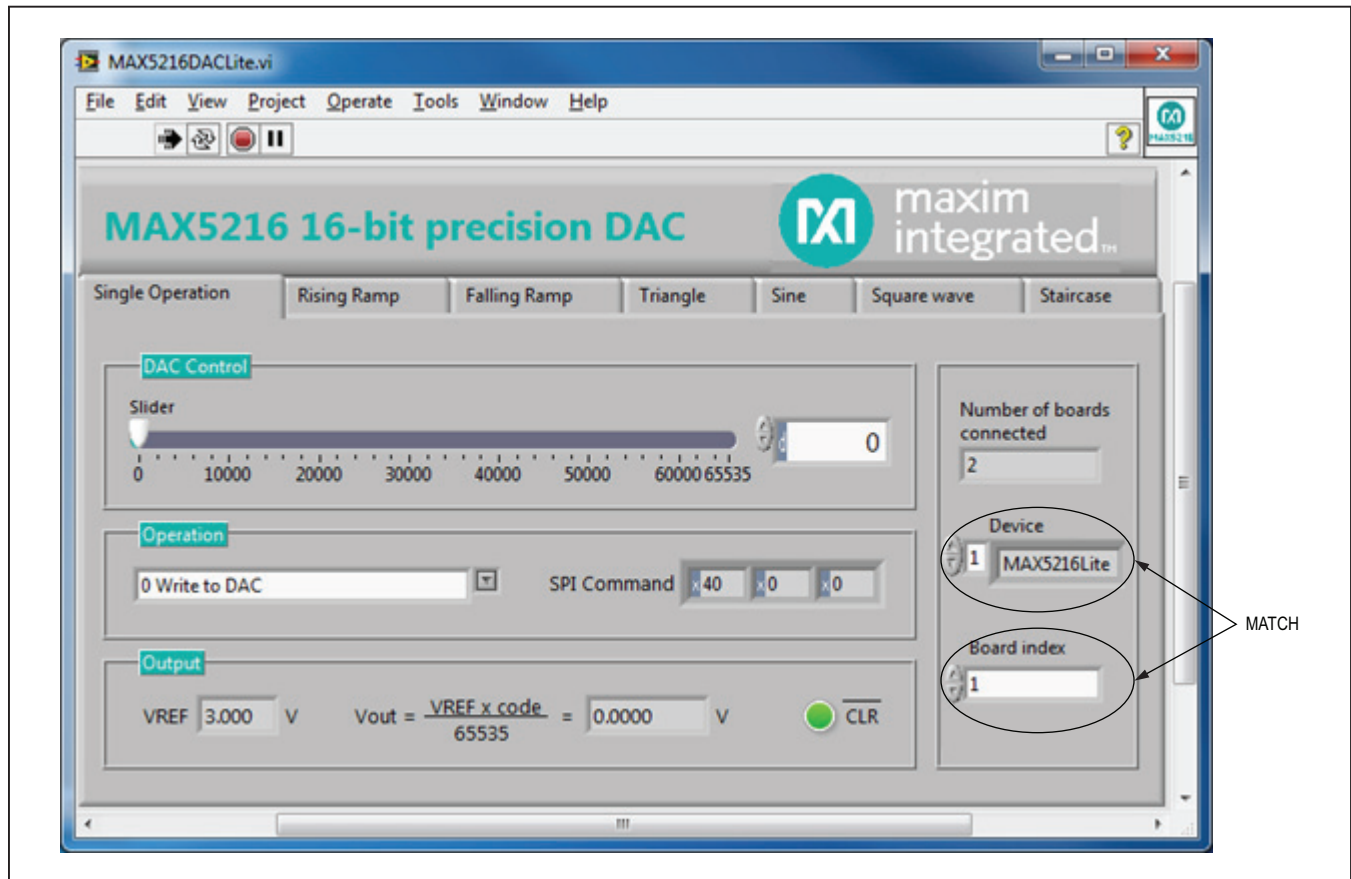

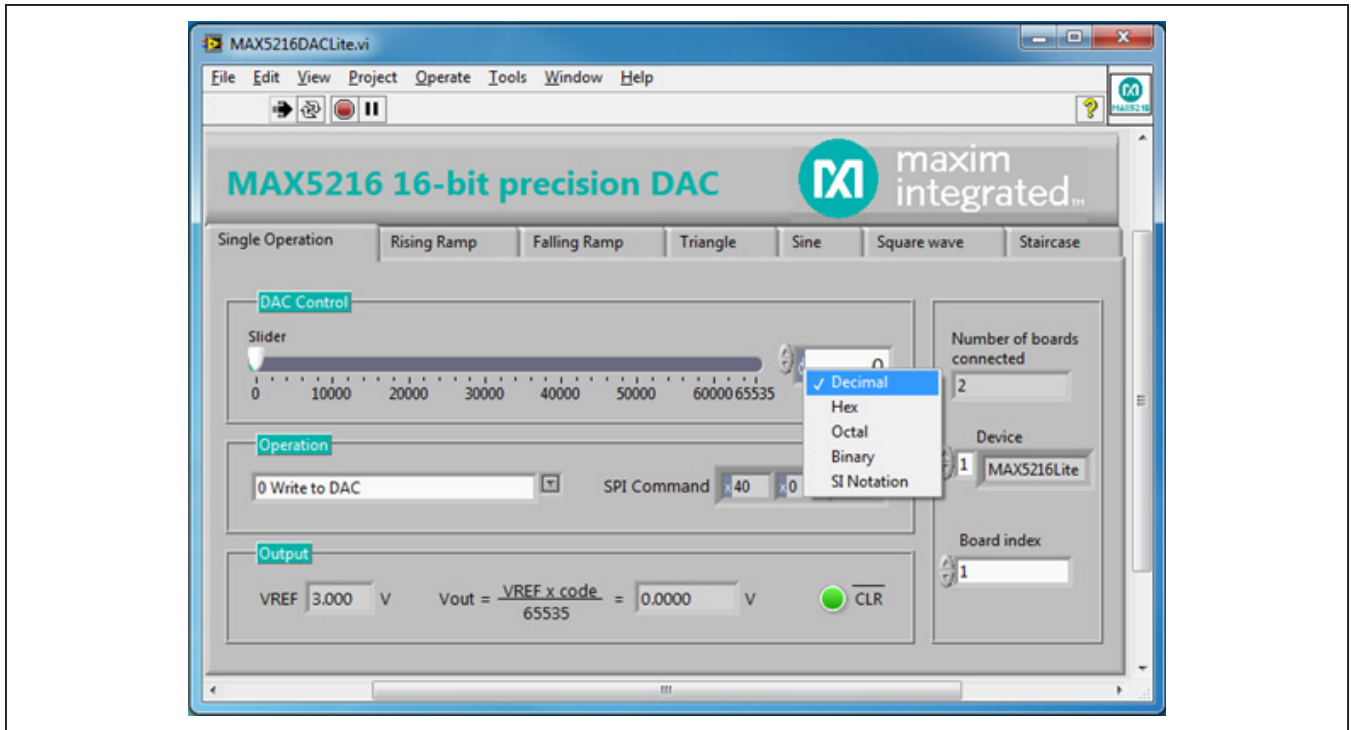Figure 3. Select the Board Index in the System with the Multiple Boards
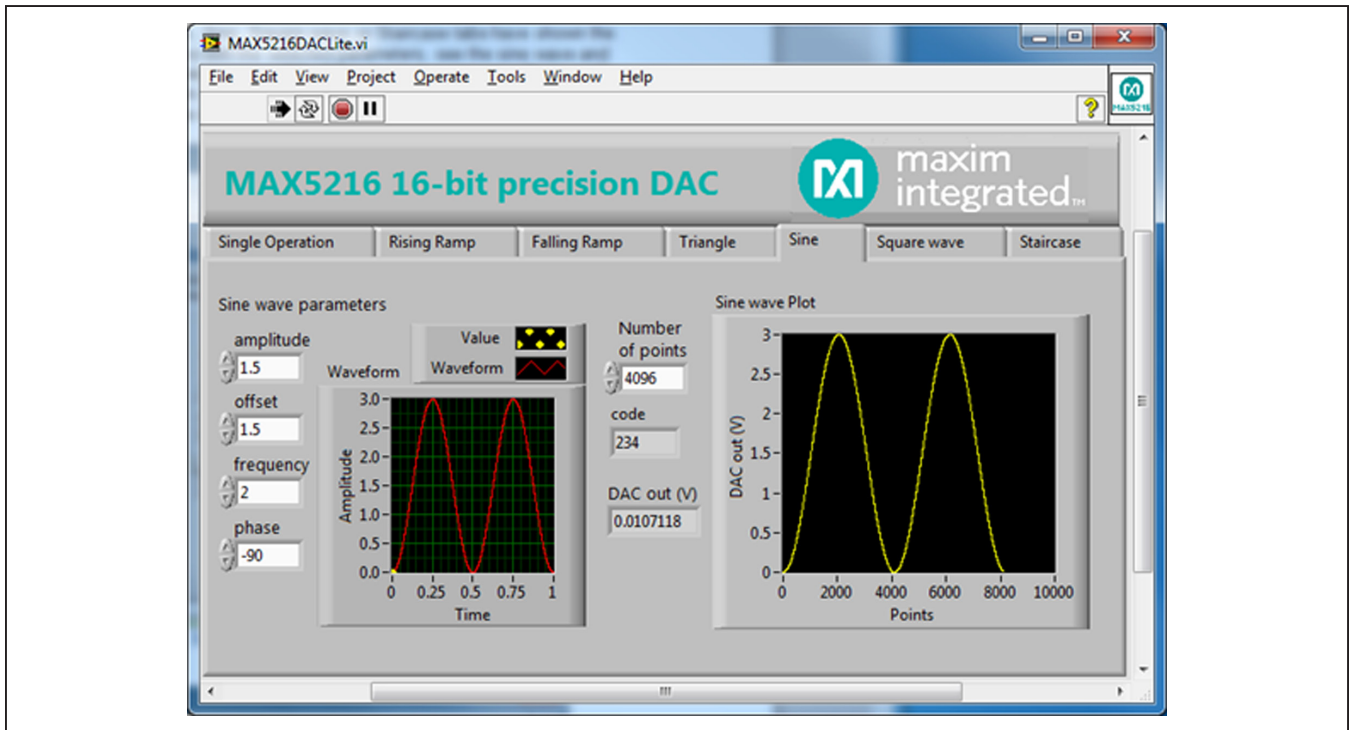
Figure 4. Notation Selection Dialog Box

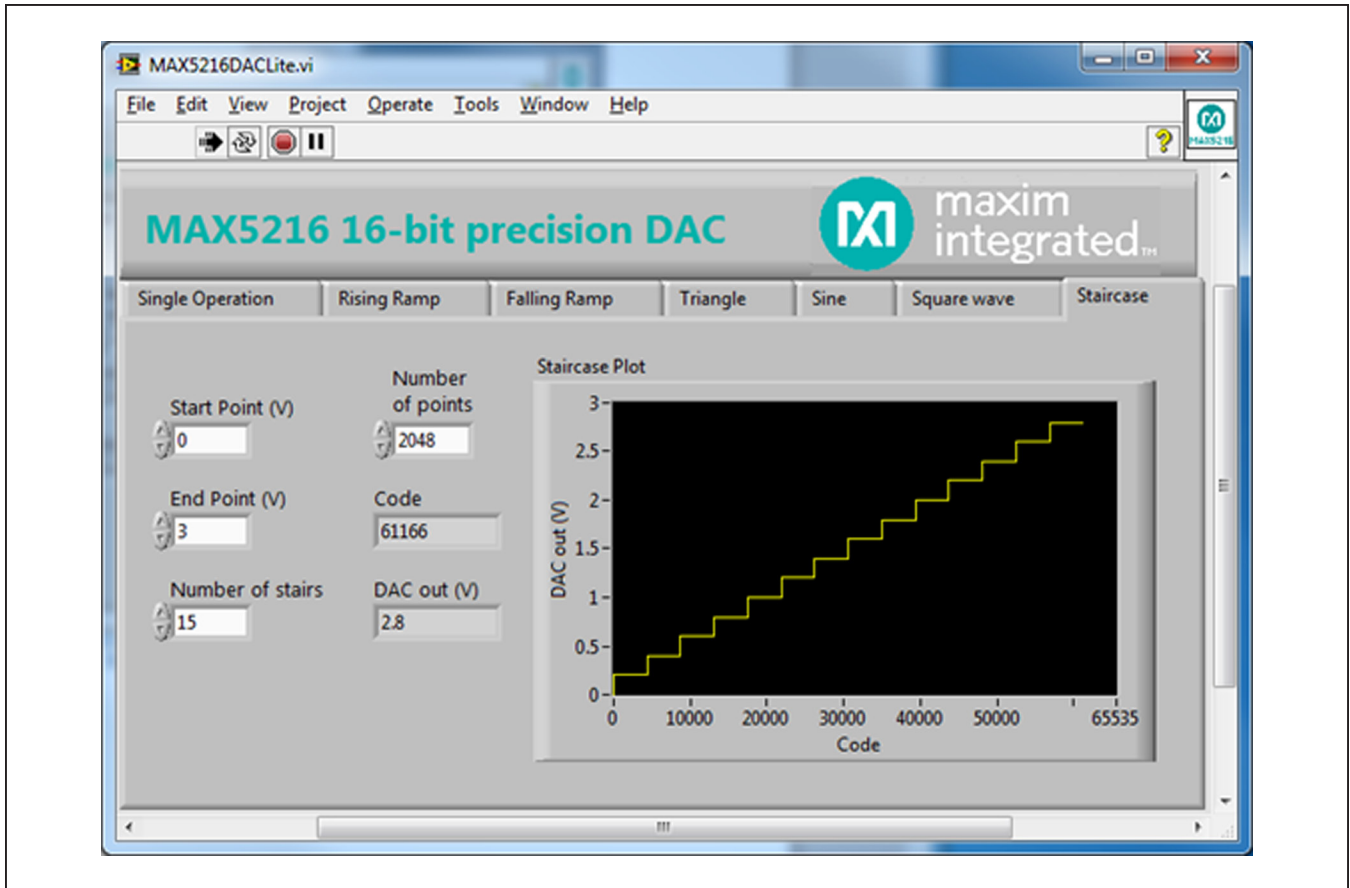*Figure 5. Sine-Wave Generator*

Figure 6. Staircase Plot

Detailed Description of Hardware

The MAX5216DACLite EV kit board is loaded with the MAX5216, Maxim's best-in-class, lowest power, 16-bit DAC. The on-board MAX6133A30 provides low noise, low temperature drift of 3ppm/°C, and 3.000V precise voltage reference for the DAC. The MAX5216 (U1) receives a command from the 16-bit MAXQ622 microcontroller (U2) through a 3-wire high-speed SPI bus. The U1 device can run at 50MHz clock frequency, but the SPI bus speed is limited to 6MHz on this board by the microcontroller. The U1–U3 devices are powered by the MAX8510 +3.3V LDO, low-noise voltage regulator (U4), which gets power from the USB port. The U1 device can be evaluated at the fixed V_{DD} level of 3.3V only. The above limitations are reflected by the suffix "Lite" in the name of the board. The EV kit block diagram is shown in Figure 7.
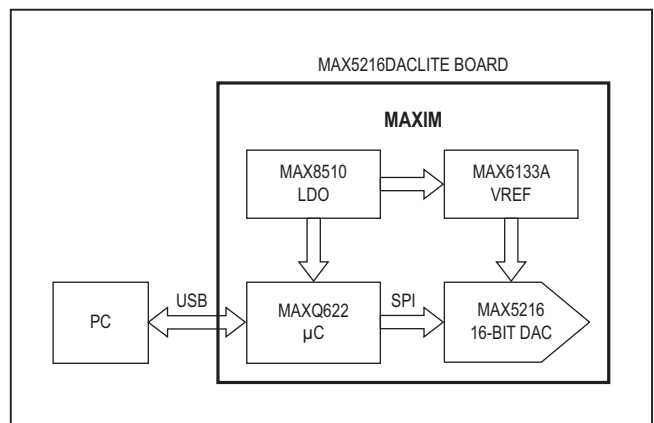

Figure 7. MAX5216DACLite EV Kit Block Diagram

The evaluation software allows full access to the DAC's functions and features through the full-speed USB 2.0 bus and the U2 microcontroller. The microcontroller is preloaded with firmware that communicates with the GUI.

MAX5216Lite Extended Features

The U1 device can be evaluated over the full voltage and SPI bus speed range with external power supply and SPI host controller. To do so, the following board modifications must be made:

1) Totally disconnect the U1 and U3 devices from the rest of the board by removing resistors R4–R9 (see Figure 10 for component placement).

2) Connect the SPI lines (CSb, SCLK, DIN, and CLRb pins) from J6 to the external host controller. Make sure that the input voltage (V_{IH}) is within the spec limit and matches the AVDD level.

3) Apply external power from 2.7V to 5.5V between J3.2 (AVDD) and J8 (GND).

4) Send command to the DAC.

The microcontroller on the EV kit board can also be programmed with custom firmware through the J2 JTAG connector (see Table 1).

Table 1. JTAG Connector Description (J2)

PIN	LABEL	FUNCTION
1	TCK	Test clock
2	GND	Digital ground
3	TDO	Test data output
4	N.C.	No connect
5	TMS	Test mode select
6	RST	Reset
7	N.C.	No connect
8	+5V	+5V from the JTAG debug adapter
9	TDI	Test data input
10	GND	Digital ground

Figure 8. MAX5216DACLite EV Kit Schematic

* Optional, may not be populated
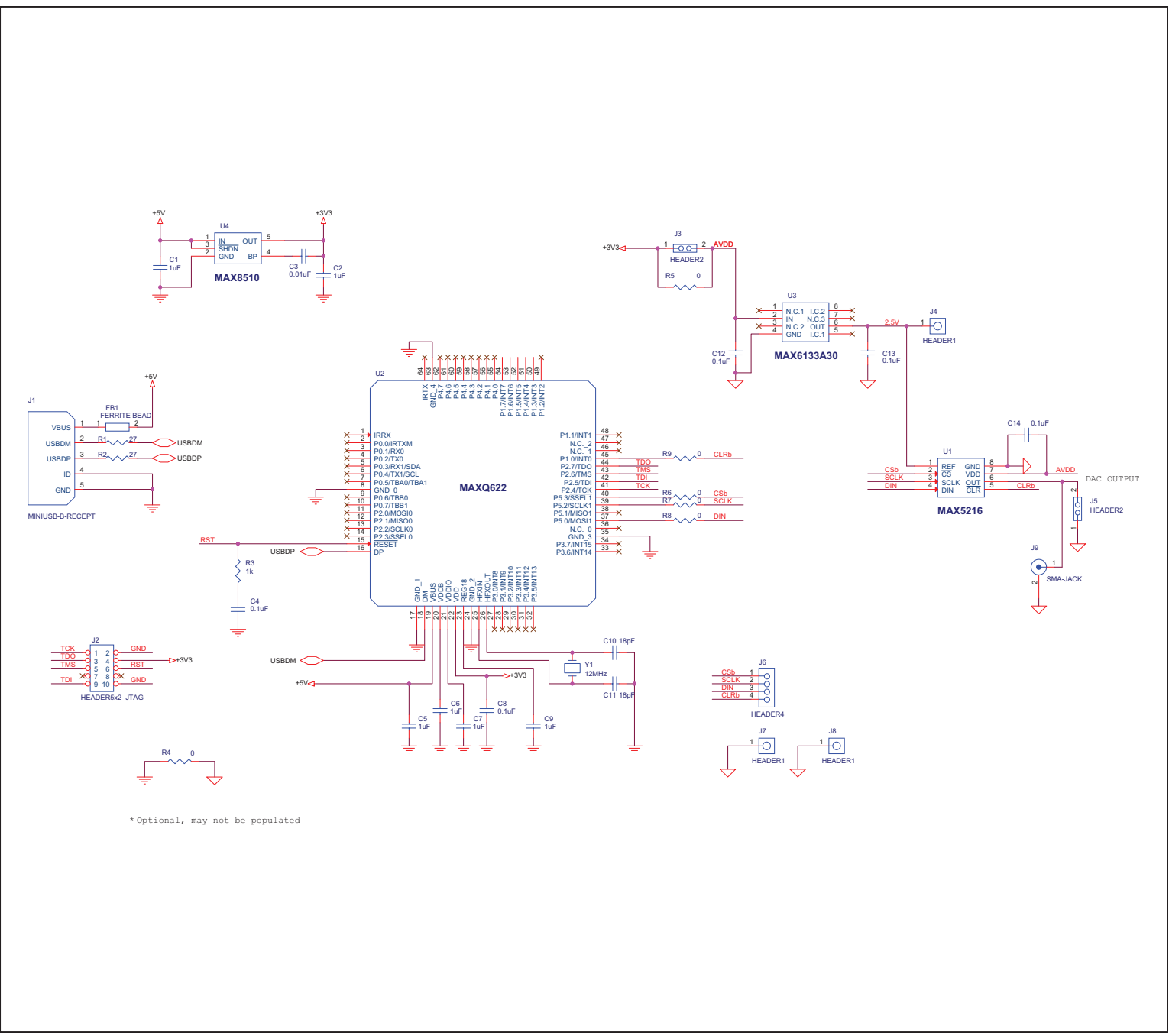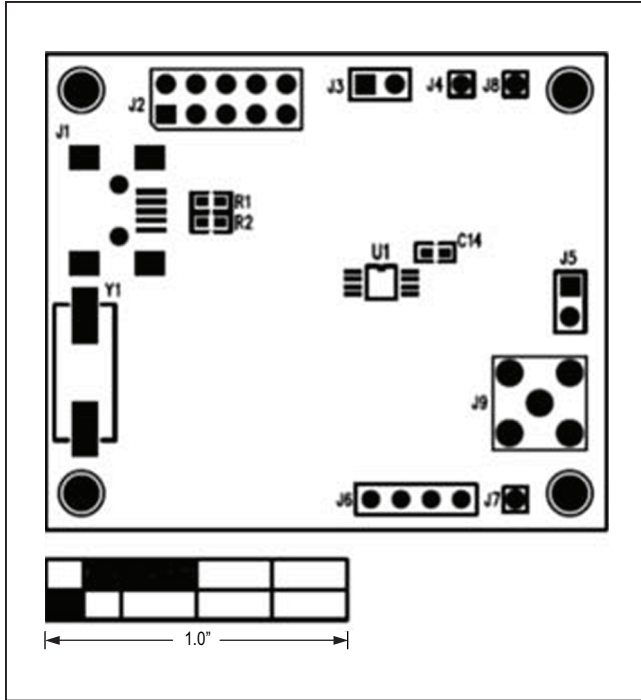
Figure 9. MAX5216DACLite EV Kit Component Placement
Guide—Top
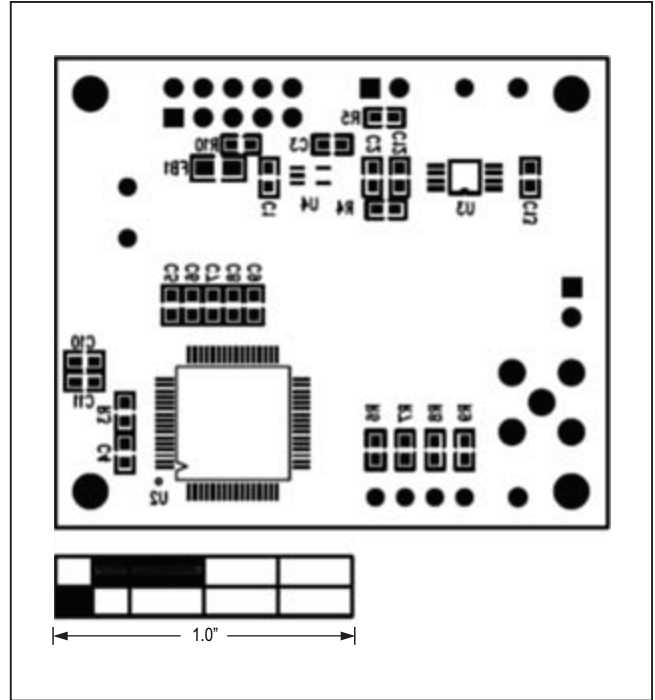
Figure 10. MAX5216DACLite EV Kit Component Placement
Guide—Bottom

Ordering Information

PART	TYPE
MAX5216DACLITE#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/12	Initial release	—